

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
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**PROMOTING SUSTAINABLE CONSTRUCTION PROJECT FINANCING IN GHANA:
CRITICAL DRIVERS, BARRIERS AND PROPOSED STRATEGIES**

BY

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Management, College of Art and Built Environment in partial fulfilment of the
requirements for the degree of

MASTER OF PHILOSOPHY

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DECLARATION

I hereby declare that this submission is my work towards the MPhil Construction Management and that, to the best of my knowledge, this text contains no material published by another person, nor material which has been accepted for the award of any other degree of the University, apart from where due acknowledgement has been made in the thesis.

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ABSTRACT

In pursuit of achieving sustainable construction of projects, the cost of constructing such projects comes with the increased cost of the project, which poses a challenge to those who are interested in sustainable construction projects. The aim of the study was exploring strategies to promote sustainable construction project financing in Ghana. The objectives set in order to achieve the aim of the study were identifying critical drivers, critical barriers of sustainable construction project financing and important strategies of promoting sustainable construction project financing. As part of the survey research technique used, a questionnaire was used to gather the views of participants. The data collected was analysed with SPSS by conducting inferential and descriptive analysis. The following were findings of the study. The critical drivers of sustainable construction project financing identified were Ethical Investment, Reduced Life Cycle Cost, Conservation of Resources, High Return on Investment and Emerging Business Opportunity. The barriers identified to be critical were Cost Related Barriers, e.g. High upfront cost, Lack of Policy direction and Regulatory gaps, Lack of Knowledge among Professionals, Inadequate Financing Schemes, Lack of Credible Database and Insufficient Government Support. Strategies that were thought to be important to promote sustainable construction project financing were: Government Support, Training and Education, Legal Framework for Sustainable Construction, Provision of incentives, e.g. Tax grants, low interest loans and Position Financial Industry to deal with Sustainable Construction. The recommendations suggested was the setting up of a green building council to oversee the transition of infrastructure in Ghana from conventional to sustainable built infrastructures. Also, there was a need for a financial institution that will cater to the financing of the construction industry in Ghana to avoid competition with other sectors of the economy from accessing capital for sustainable construction projects.

Keywords: Sustainable Construction, Sustainable Construction Project Financing, Critical, Drivers, Barriers, Important, Strategies

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DEDICATION

I dedicate this thesis to the Almighty God and most especially to my parents Mr Alexander Oppon and Madam Victoria Oppon for their unconditional love, support, guidance and encouragement for making this programme (MPhil Construction Management) a success.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Sustainability is the present generation using resources prudently for future generations also to have the opportunity to use the same resources to improve their lives and make it comfortable. Sustainability is not only about natural resources, but it also includes economic development and social equity (Kuhlman and Farrington, 2010). Kuhlman and Farrington (2010) stated that sustainability is based on three principles which form the basic concept, namely, the environment, economy, and social aspect. Economic sustainability is when systems are put in place to maintain peoples' independence and secure their livelihood. Environmental sustainability is the use of natural resources in a way such that they can replace themselves. People attain social sustainability when they have access to resources to ensure that their families and communities are safe and healthier.

Sustainability as a global phenomenon has led to the advocacy of sustainable development which is to meet the necessities of the present without depriving future generations the chance to meet their own needs (Kates et al., 2005). As such industries in the world over are tailoring their activities to help check the destruction of natural resources. The construction industry is no different as it is one of the largest in the world and contributes mostly to economic GDP's of countries but is also a significant user of energy, water and raw materials (Akadiri et al., 2012). Shan et al. (2017) noted that 40% of the energy produced globally and 40-50% of the world's raw materials are used up by the construction industry.

The performance of other economic sectors such as health, manufacturing, and the likes is dependent on the construction industry (Oyedele, 2013). Incorporating sustainable practices in the construction industry will lead to the achievement of sustainable development. Djokoto et

al. (2014) defined sustainable construction as the establishment and the management of a dynamic built environment based on the judicious use of resources and environmental standards.

Sustainable construction was described by Ametepey et al. (2015) as the process of decision making that ensures sustainability right from the design stage, construction stage and post-development stage and the entire life cycle of the building. For a project to be termed as sustainable, it must meet a certain number of objectives which includes improved indoor air quality, harmonization with the environment, reduction in pollution and raw materials usage, CO₂ emission reduction, and must have a modest maintenance and be quickly demolished when abandoned (Akadiri et al., 2012). For such an objective to be achieved for a particular project, that project should receive the needed financial backing. Sustainable construction project financing is the raising of financial capital for sustainable construction projects or companies that are dedicated to supporting the development of a low-carbon and more sustainable environment (Shan et al., 2017). Höhne *et al.* (2012) also defined sustainable construction project financing as financial investments focused on sustainable development projects. Soundarrajan and Vivek (2016) noted it was a strategic method where several financial institutions like banks, insurance firms, property companies, mutual funds, institutional investors and the others direct their financial resources to the development of the sustainable projects. In some parts of the world, notably in most developed countries, this concept has gained lots of attention (Shan et al., 2017). Barriers and drivers of sustainable construction project financing are widely reported in the literature (Shan et al., 2017). When pushing for the adoption of sustainable projects and its adaptation, it is critical to discuss the financing aspect. Given this, this thesis developed key strategies that can be used in order to promote the adoption of sustainable construction projects in a developing country.

1.2 PROBLEM STATEMENT

Because of the increase in population across cities around the world, there is a high demand for building infrastructure to cater to their needs and this has led to the gradual reduction of natural resources and pollution due to the reliance of the construction industry on these resources to meet the necessities of the increasing population (Shan et al., 2017). Since sustainable construction has now become an issue of worldwide concern, strategies need to be developed to help in the financing of such projects.

The cost of sustainable construction project poses a challenge to stakeholders interested in sustainable construction projects (Lee *et al.*, 2013). Developed nations such as the United Kingdom, United States of America, Singapore and China, to name a few have developed practices for financing such projects. Organizations such as United Nations Environment Program (UNEP), the Organization for Economic Co-operation and Development (OECD) and the International Finance Corporation (IFC) have been set up to support the work being undertaken by countries towards achieving sustainable construction by also formulating policies and bringing onboard investment's from other financial sectors t.o help fund sustainable construction (Shan *et al.*, 2017).

Although these developed countries and organisations have taken the lead in formulating policies and practices that can help them finance sustainable construction projects, such cannot be said about developing countries of which Ghana is part. Therefore there is the need to explore strategies for such actions, especially, in countries such as Ghana where development priorities, the capacity of government and local construction industry, as well as skills are wide-ranging compared to developed nations (Du Plessis, 2001). Of late, most construction-related research in Ghana has been shifted towards sustainability issues. Quite recently, Ampratwum (2017) proposed a framework to enhance the implementation of green certification of buildings

in Ghana. Opoku (2016), in his study, also proposed guidelines for building the capacity of built environment consultants to practice sustainability at the design stage of projects. Sarfo-Mensah (2016) examined the contractors' adaptation to environmentally sustainable construction processes in Ghana. Darko and Chan (2018) have proposed strategies for the adaptation of green building technologies in Ghana. These and some few other developments have evolved over the years in Ghana.

It is evident from the above examples that there is some substantial amount of information available in Ghana when it comes to sustainability. However, most of the issues that have been discussed mainly centre on the capacity building of the professionals involved as well as ways to adapt the sustainability processes. The fundamental question that needs addressing is how do the construction professionals and companies adapt and practice sustainability if the financing of sustainable projects is lacking? Ametepey et al. (2015) indicated that one of the barriers affecting implementation of sustainable construction in Ghana was financial issues. In addressing this issue, this study seeks to explore key strategies that will accelerate the promotion of financing of sustainable construction projects in Ghana.

1.3 RESEARCH QUESTIONS

The study will attempt to find answers to the following questions:

1. What are drivers critical for the financing of sustainable construction projects in Ghana?
2. What are the critical barriers that affect the promotion of sustainable construction project financing in Ghana?
3. What important strategies can be adopted for the promotion of sustainable construction projects financing in Ghana?

1.4 AIM AND OBJECTIVES

1.4.1 Aim

This study aims at exploring strategies to promote sustainable construction project financing in Ghana.

1.4.2 Objectives

In achieving the aim, the following objectives were proposed:

1. To identify critical drivers of sustainable construction project financing in Ghana;
2. To identify the critical barriers to the promotion of sustainable construction project financing in Ghana;
3. To identify important strategies for promoting sustainable construction project financing in Ghana.

1.5 SCOPE OF THE STUDY

The study aims at identifying important strategies for the promotion of sustainable construction project financing. Drivers and barriers which were critical to the financing of sustainable construction project financing were identified. Professionals in the construction industry and those in the finance industry with experience or knowledge on sustainability and sustainable construction financing were targeted.

1.6 METHODOLOGY

In order to conduct vigorous research, the research adopted various philosophical considerations to help address the aim and objectives of the research. The study adopted the deductive form of reasoning to help achieve the aim and objectives of the research. The quantitative method of enquiry was used to collect needed data by assessing how critical barriers and drivers are to sustainable construction project financing and the importance of strategies in the acceleration of financing of sustainable construction projects. The research strategy utilised for the study was survey research. Survey research enables one to collect data

quantitatively when the deductive form of reasoning has been selected for the research (Saunders et al., 2009).

Primary and secondary sources of data were utilised for this study. The secondary data in the form of existing literature was used in the development of a questionnaire to solicit the views of participants who had the knowledge or were experts in sustainable construction. The participants were made up of professionals in the construction industry and those finance backgrounds. Purposive since sampling technique was used to select participants based on their backgrounds.

Descriptive and Inferential analyses were conducted from the data collected using Statistical Packaging for Social Sciences (SPSS).

1.7 JUSTIFICATION OF THESIS

This study was of enormous benefit to the Ghanaian construction industry and its partners as they seek to champion more sustainable projects in the country. This study addressed the gap between implementing sustainable projects and how they are financed in Ghana. Based on the objectives, important strategies that promote sustainable construction project financing was explored.

1.8 THESIS STRUCTURE

The thesis used the monograph approach and consisted of five (5) chapters. Chapter one consists of the background to the study, problem statement, aim and objectives of the research, research questions, thesis structure, methodology, justification of the thesis, and scope of the thesis. The literature reviewed was covered in the second chapter. The third chapter presents the methodological approach that was used to gather information and its analysis to achieve the aims and objectives of the thesis. Results and discussion of objectives were covered in the fourth chapter using data gathered from the field. Chapter five presents conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

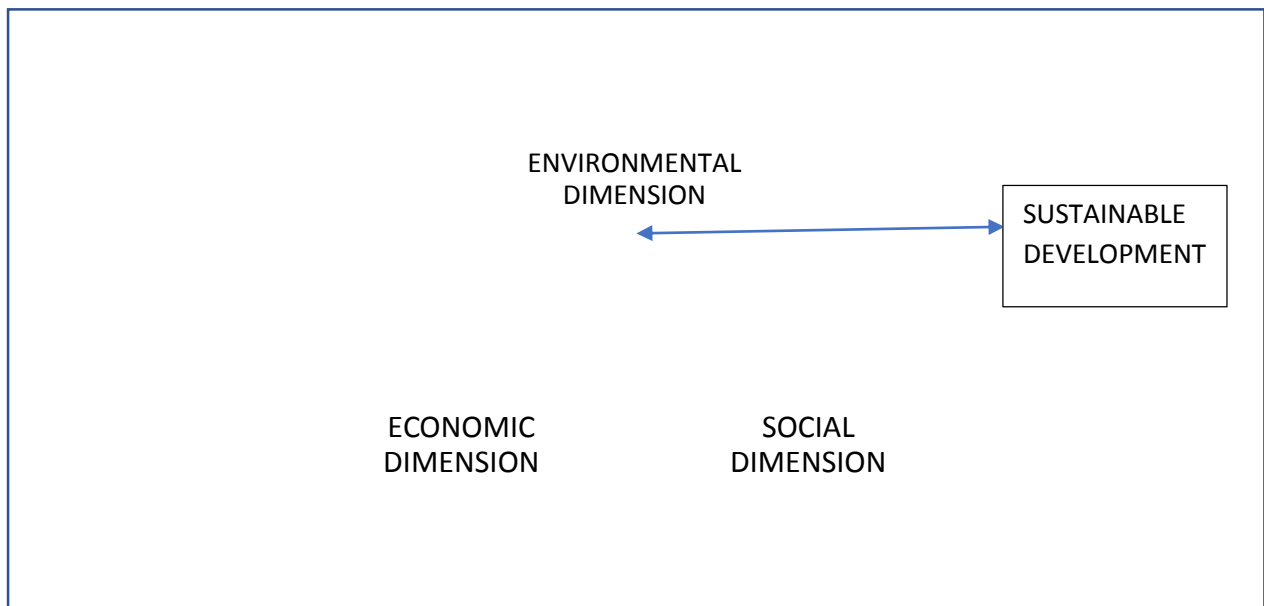
2.1 INTRODUCTION

This chapter dealt with the review of the relevant literature on the topic under study. In reviewing the available body of research on the subject under investigation, the reviewed literature included the following: Definitions and concepts of sustainability and sustainable development: further discussion on sustainable construction and sustainable construction financing. Critical drivers and barriers of sustainable construction project financing were reviewed in this chapter. Important strategies for the promotion of sustainable construction project financing was reviewed as well.

2.2 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Many authors have defined sustainable development, but the majority of them centred on the interpretation in the Brundtland Commission report in 1987 (Emas, 2015). Sustainable development is making of development sustainable to meet the necessities of the current generation without depriving future generations of the same resources (Kates et al., 2005). Uher and Lawson (1998) defined sustainable development as development that allows the current generation to use available resources judiciously in order not to compromise the ability of the future generation also to use the same. Sustainability is not just about the environment as discussed in several literary works; there are concerns for social equity and economic development (Kuhlman and Farrington, 2010). The goal of sustainable development is the fusing of environmental, economic and social concerns in our decision making process (Emas, 2015). Figure 2.1 below shows the triple bottom line approach concept developed by Barbier (2002). The figure shows how the three dimensions of sustainability come together to form sustainable development.

Figure 2.1 Triple Line Bottom Approach of Sustainable Development



Source: (Barbier, 2002)

2.2.1 Sustainable Construction

Sustainable construction means different things to different persons. There are multiple definitions which exist, and there is a discrepancy regarding scope and context (Ametepey et al., 2015). Sustainable construction is described as part of sustainable development and its use in the construction industry (Ametepey et al., 2015). The construction industry is made up of different professionals who are involved in the design stage, construction stage and post construction stage and also include manufacturers and suppliers of construction materials (Mehta et al., 2008). Djokoto et al. (2014) defined sustainable construction as the development and responsible management of a healthy built environment based on the judicious use of resources and ecological principles. Figure 2.2 below shows a detailed roadmap presented by Kibert and Haovila indicated the link between sustainable construction and sustainable development (Enshassi and Mayer, 2005).

Figure 2.2 Roadmap for Sustainable Construction by Kibert and Haovila

Source: (Enshassi and Mayer, 2005)

2.2.2 The Ghanaian Construction Industry and Sustainability

One of the critical industries in the world that drives the socio-economic development of a nation by contributing infrastructure to other critical industrial sectors is the construction industry (Ofori, 2012). A study by Ofori-Kuragu et al. (2016) showed that the construction industry in Ghana contributes approximately 8.2% per annum to the gross domestic product (GDP). Challenges in the Ghanaian construction industry is well documented. Delay in payment, inability to secure funds for projects to mention a few are some of the challenges hindering the growth of the industry (Ofori-Kuragu et al., 2016).

Much work has been done by academia on how to incorporate sustainable practices in our construction industry, barriers affecting the implementation of sustainable construction practices, building the capacity of the industry. Some of the research works carried out by academia to help improve the construction industry in terms of sustainability are Adjarko *et al.*, (2016) on Implementation of Environmentally sustainable principles in the Ghanaian construction industry, consultants perspectives of barriers to sustainable construction in

Ghana's construction industry by (Djokoto et al., 2014b). These and some few other developments have evolved over the years in Ghana. Government is trying to help promote more sustainable construction projects through the help of the Ghana Venture Capital Fund which is ready to support real estate firms with the sum of Twenty Million Dollars to build low cost infrastructure that conserves our resources. (IFC, 2017b). Organisations are currently making inroads in the Ghanaian construction industry with regards to sustainable construction. The Ghana Green Building Council with professional's members are committed to create awareness and implement sustainable communities in Ghana while IFC in collaboration with international certifying body SGS as its local partner is seeking to implement EDGE certification in Ghana (IFC, 2017b).

Over the years, several sustainably constructed projects by both government and the private sector have been implemented in Ghana using various green certification standards from LEED, Green Star and EDGE rating systems to achieve sustainable buildings. The table below shows a list of sustainable construction projects undertaken in Ghana and their current status.

Table 2.1 List of Sustainable Construction Projects in Ghana

| No. | Description | Location | Project Status | Nature/Status of Certification | Date |
|------------|---|--------------------------------|-----------------------|--|-------------|
| 1 | Takoradi Shopping Mall | Heritage street, Takoradi | Completed | EDGE Certified | Dec 2018 |
| 2 | Atlantic Towers | Airport City, Accra | Completed | EDGE Certified | Dec 2018 |
| 3 | Mother and Baby Unit (MBU), Komfo Anokye Teaching Hospital (KATH) | Bantama, Kumasi | Completed | EDGE Certified | Jan 2018 |
| 4 | GNPC Research and Technology Centre | Spintex Road, Accra | Unknown | LEED v4 BD+C NC Registration | Feb 2018 |
| 5 | Consar Ltd New Head Office | Spintex Road, Accra | Under Construction | LEED v4 BD+C NC Registration | Aug 2017 |
| 6 | Accra Regional Hospital | Ridge, Accra | Completed | LEED HC 2009 Silver Certification | Dec 2016 |
| 7 | Exchange Complex – Radisson Blue Hotel | Off Independence Avenue, Accra | Under Construction | EDGE Preliminary Certification | Apr 2016 |
| 8 | Exchange Complex – Residential blocks A & B | Off Independence Avenue, Accra | Under Construction | EDGE Preliminary Certification | Apr 2016 |
| 9 | One Airport Square | Airport City, Accra | Completed | 4 Star Green Star SA Office v1 Design Rating | May 2013 |
| 10 | Silver Breezes Hotel | Abeka Road, Accra | Unknown | LEED for New Construction 2009 Registration | May 2011 |

Sources: Agana (2018), Asaase (2012), EDGE (2019a), GBCSA (2014a), Green Building Information Gateway (GBIG) (2019), USGBC (2019a), USGBC (2019b), USGBC (2019c), USGBC (2019d)

2.2.3 Project Financing

Project finance has been well established in the literature by different authors. According to Finnerty (2007), as cited in (Byung and Soon, 2017), project financing is raising of funds for capital intensive projects by forming a special purpose vehicle to operate and repay debt accrued from the establishment of the facility. Blanc-Brude and Makovsek (2013) noted that project financing is a form of financing long term infrastructure project where cash flow generated from the operationalisation of the project is used to repay the debt for the procurement of the infrastructure. The nature of project financing is such that, it brings together a consortium of investors to undertake infrastructure project too large for an individual investor to underwrite (Gardner and Wright, 2012). Project finance is used to differentiate between the credit risk of the project and that of the sponsors so that investors can conduct their valuation based on the economic viability of the project (Pinto, 2017).

2.2.4 Cost of Conventional Construction Compared To Sustainable Construction Projects

Building users are more concerned with how efficient, reliable and affordability of their buildings. (Weerasinghe and Ramachandra, 2018). The initial cost for sustainable constructed projects cost 1-25% higher compared to conventional buildings due to the introduction of materials and new technologies implemented in the building (Hwang and Tan, 2012b). According to Zhang *et al.* (2017), the cost of green materials used is 3-4% higher than conventional materials. An example stated was that the cost of a wheat board was ten times the cost of standard plywood used in conventional buildings.

Several authors have documented the higher cost of sustainable buildings reducing investment in such projects. Kats (2003) reported that there is a perception that sustainable construction projects cost more and is not worth the extra cost even though benefits have been recorded in literature. Rehm and Ade (2013) noted that the perceived higher capital cost of sustainable buildings had remained a significant hindrance to the adoption of such projects. Others have

also argued that the life cycle cost of a sustainable building should be considered when talking about cost instead of just considering the initial capital investment made (Kats, 2010).

2.3 SUSTAINABLE CONSTRUCTION FINANCING

Lee et al. (2013) noted that, there was a paradigm shift from traditional buildings to sustainable construction projects in order to reduce the damage to the environment. Dania (2017) noted that the importance of sustainable construction projects had gained attention in recent years, but the question which remained unanswered was how sustainable construction projects would be supported to increase propagation and market transformation. In order to make this paradigm shift possible, there is a need for ways for which these sustainable construction projects remain financed are determined. Sustainable Construction Project financing has been defined differently by various researchers. Raising of financial capital for sustainable construction projects or sustainable development is known as sustainable construction project financing (Shan et al.,2017). Höhne et al. (2012) defined sustainable construction project financing, as financial investment geared towards sustainable construction projects. The sustainability premium placed projects increase the upfront cost, and therefore, there is a need to raise additional funding to support and increase the number of sustainable buildings (Meltzer, 2015).

2.3.1 Approaches Used To Finance Sustainable Construction Projects

Financial vehicles are investment tools used to finance projects. This section is going to discuss the various financial vehicles that can be used to fund sustainable construction projects. The financial vehicles identified from the literature include Government Interventions, Green Bonds, Bank loans, International Assistance, and Private funding and are similar to existing financial vehicles used to finance traditional buildings but this time around has a lot of environmental benefits linked to it.

2.3.1.1 Government Intervention

Zhan and de Jong (2018) stated from their research that, financing sustainable construction projects requires an enormous financial investment. There is also a high risk attached to sustainable construction projects as such; it is essential government plays a pivotal role to drive the agenda of sustainable construction of projects (Lee *et al.*, 2013). The US government at the federal, state and local level play an essential role in the promotion of sustainable construction of projects and also financing by ensuring that their buildings meet sustainable requirements. They provide financial incentives that are used to fund sustainable construction projects, and these incentives cover both the private and non-profit sectors (Tobias and Llc, 2007). According to Vardhan (2017), most developing countries attract foreign investment by granting incentives. In Malaysia, construction projects that meet the green building index are given property tax reduction and depending on the level of certification of the property the owner of a building may get a tax credit (Lockwood, 2008).

The Malaysian government introduced the Green Technology Financing Scheme (GTFS) as an effort to accelerate the construction and retrofitting of more buildings to meet sustainable certifications (Diyana and Abidin, 2013). Azis *et al.* (2013) also noted that governments through it, local authorities can support the financing of sustainable construction projects. The support can be in the form of tax incentives given through tax reduction or exemption on materials and equipment's that are used in the construction of sustainable projects or tax credit in the form of cash backs which is given to investors who financed such projects. As noted by Thornley *et al.* (2011), the Dutch government through its Green funds scheme allows investors to deposit funds into green funds which are lent out at a lower interest rate for projects sustainable construction projects and in turn the investors get tax incentives to make up for the lower rate of return on their investments.

2.3.1.2 Green Bonds

According to EY (2015), a green bond is a debt instrument, that offers a fixed return, and a promise to use the profits to finance, in part or wholly, new or existing sustainable projects. The bond issued is for a specified period by financial institutions, governments or firms that need to raise funds from the capital market (Salman et al.,2012).

It can also be defined as an income tool that allows the issuer to tap into debt capital markets and use the proceeds to finance projects that have environmental benefits. They are similar to conventional bonds in almost all facets apart from the use of profits that are allocated by their issuer for investments in sustainable projects, an intention that is commonly specified in the bond's legal terms. A private sector entity issues them, a public sector entity of International Organisations such as (World Bank, IFC, EIB) who have an interest in sustainable projects (OECD, 2012). There are other definitions for green bonds, and another notable definition by the OECD is that the use of green bonds can be differentiated from the other bonds by the way the proceeds are utilised, which signifies a commitment to entirely use the funds raised to finance or re-finance sustainable projects, assets or business activities(OECD, 2015).

Green bonds could also be termed as fixed income securities, which finance sustainable projects with environmental benefits. Green bond issuance has evolved significantly from 2013-2017 (Ehlers et al., 2017). Most of these issuers have been international organisations such as European investment banks, cooperate with organisations in China and countries such as the United States of America and other European countries have also been issuing green bonds. The maturity of green bonds are usually medium-term and ranges between seven to eight years, but this period has increased due to the gradual pace in issuance of green bonds. According to the Climate Bonds Initiative (2017) issuance of green bonds from 2007 to 2017 has been 234 billion dollars. A study by Kaminker (2018) indicated, the cumulative issuance of green bonds

reached for the 2018 year to date reached USD 97 billion and total cumulative green bond issuance hovering just below the USD 500 billion.

2.3.1.3 Bank Loans

Banks play a crucial part in the financing of infrastructure around the world. They can choose to lend to a clean or dirty industry, but in recent years regulations concerning sustainability have been introduced by members of the Sustainable Banking Network hosted by the International Finance Corporation (IFC), which aims at allowing the banks to invest in more sustainable construction projects (Cui et al., 2018). Banks are active in the area of investments in sustainable construction projects by providing funds for entities that are playing a crucial role in sustainable development (Jeucken, 2001). One of the most common financing vehicles used for financing of infrastructure was banks loans since they are flexible and easy to obtain. TEID, the financers of the SSTECH project collaborated with 12 different banks and were able to raise CNY 10.24 billion from the 12 banks to finance their project (Zhan and de Jong, 2017). In America, banks such as Citicorp, Bank of America and Wells Fargo have announced significant green lending plans (Tobias and Llc, 2007). The Romania Green Building Council has partnered with banks to provide a mortgage to prospective customers who want to purchase sustainable buildings (RoGBC, 2014). Local banks in India such as the State Bank of India, the IDBI Bank and the ICICI Bank as well as foreign banks including Standard Chartered, Barclays and the ABN Amro operating in the country have launched financial vehicles that are aimed at financing renewable energy projects (Soundarrajan and Vivek, 2016). In Mexico, the Infonavit's Green Mortgage Program was initiated in 2007, to provide potential homeowners with additional funds to purchase new residential facilities which integrate sustainable and energy-efficient technologies, the program targets state-aided house buyers with low-income. The Green Mortgage beneficiaries can get a higher loan dependent on the increase in their capacity to pay off the mortgage, derived from energy and water savings (Kapoor, 2012).

As at 2017, members of the International Development Finance Club (IDFC) made of development banks who have united to help countries achieve sustainable development had contributed about US\$ 220 Billion to finance various sustainable projects (IDFC, 2018). Majority of banks in the Netherlands partake in sustainably constructed projects through the Green Fund scheme because of its high demand from customers (Thornley *et al.*, 2011).

2.3.1.4 International Assistance

According to the OECD (2014), there are International Finance Institutions (IFI's) which are providing funds for projects such as sustainable construction projects in Eastern Europe. Funding for sustainable construction projects can be secured from various international organisations or groups with an interest in sustainable projects to protect the environment. Measures have been put in place by the Organisation for Economic Co-operation and Development (OECD) to support nations to scale up public finance and also attract private investment for sustainable construction projects (OECD, 2012). From 2005, IFC, a World Bank Group, had invested \$15 Billion in sustainable construction projects and aimed at increasing investment in sustainable projects by 28% in the year 2020 (IFC, 2017a). Kapoor (2012) revealed in his study that, the IFC group does not only provide financing for sustainable construction projects but also provide upstream investment in technology and materials used in the construction of sustainable projects thereby reducing the cost of this technology and materials to the end-users.

The World Bank Group supported the Sino-Singapore Tjian Eco-City project with a Global Environmentally Facility Grant to the tune of US\$ 6.16 million to help achieve the aim of the project (Zhan and de Jong, 2018). The European Bank for Reconstruction and Development, for instance, issued a green bond worth USD 650 million targeting institutions needing funds to finance sustainable construction projects and other projects which are deemed sustainable (EBRD, 2016).

2.3.1.5 Private Funding

Sustainable construction projects involve investments which are long-standing and permanent financing (Chan et al., 2009). Conventionally, public funds are a critical financial source for sustainable construction projects. However, given the pressure on public resources, private funding is very crucial and needed for the financing of sustainable construction projects (Love *et al.*, 2015). Part of the funds used for the construction of the Sino-Singapore Tianjin Eco-City was privately sourced in order to reduce the pressure on governments or its local representative (Zhan and de Jong, 2017). Private funding can be obtained from private entities such as real estate developers, insurance companies, charities, and pension funds, mutual and endowment funds. These private investors have pledged to finance sustainable projects to the tune US\$ 125 million every year till the year 2020 (Fabian, 2015). There has been a growing amount of private funding from private firms that are used in the sustainable construction sector over the past ten years (Yudelson, 2010).

Transitioning to a more sustainable development era over the next 20 years requires significant investment from private sources and on a much larger scale than previously.

Meltzer (2015) noted that about \$3 trillion per annum is needed to fund sustainable construction projects over the next 15 years. In order to attain this, the private sector is required to mobilise half of this amount to help the financing of such projects. According to Della Croce *et al.* (2011), pension funds, along with other institutional investors with their USD 28 trillion in assets potentially have an essential role to play in supporting sustainable projects. A lot of these IFI's are playing their roles to attract investors, one of them is the European Investment Bank, which has created financial products that take on the risk of investing in sustainable construction projects. These products tend to attract banks and other institutional investors to finance projects that were initially not considered for investment (EIB, 2016). According to Merk *et al.* (2012), the private sector can fill the gap for investment in sustainable construction

projects by engaging them through the use of public-private partnerships or private finance initiatives to scale the level of investment in sustainable construction projects. Bielenberg *et al.* (2016) noted that involving the private sector in the financing of sustainable projects can bring other benefits apart from the investment. In order to ensure their investments are safe and yield results, by developing projects that have commercial value, reduce costs overruns of the projects and signal others, it is safe to invest in sustainable construction projects.

2.4 DRIVERS FOR IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION FINANCING

This section discussed the various factors that assist in implementing sustainable construction financing. Some of the drivers identified that can help in promoting the financing of sustainable projects in the construction industry are presented, including the following: ethical investment, corporate image, corporate social responsibility.

2.4.1 Corporate Social Responsibility

McWilliams and Siegel (2001) noted that actions that seem to promote some social good, beyond the benefits of the firm and not mandated by law are termed as corporate social responsibility. Orlitzky *et al.* (2006) defined corporate social responsibility as decisions that enhances the competitiveness and reputation of a firm. Such decisions should result in growth in the financial and economic performance of the entity. In a time of global climate change issues, there is increased regulatory, consumer and employee pressure, for corporations to become energy efficient and reduce their carbon footprints (Sullivan and Gouldson, 2016). According to Franc *et al.* (2006), these definitions mentioned above gives credence to the definition of corporate social responsibility by the European Commission that these collective actions are for the improvement of the wellbeing of society. These developments have driven

corporate social responsibility (CSR) programs like the Carbon Disclosure Project and the Climate Registry (O'Mara and Bates, 2012).

Meanwhile, companies want sustainable facilities that attract and retain the best talent in their industry, increase employee productivity and well-being. It is vital to reduce operating costs, energy use, and environmental impacts. All of these issues help organisations meet corporate social responsibility goals (O'Mara and Bates, 2012). Firms who as part of their corporate social responsibility finance projects which are sustainable voluntarily can gain a competitive gain over those who choose not to invest of finance such projects because with time the requirements for implementing specific environmental policies must become mandatory and no more voluntary (Soundarrajan and Vivek, 2016). Also Sustainably built buildings reduce the cost of companies that invest in it because of their efficiency in their operation and also an investment in sustainable constructed project signal a commitment to corporate social responsibility which in turn affect consumers, employees positively (Nguyen, 2014). As part of an entity's environmental responsibility, they can decide to invest in sustainable construction projects for their office space or any facility they construct (Diyana and Abidin, 2013).

2.4.2 Ethical Investment

Ethical investment is one of the emerging trends in the financial services industry particularly in the united states where it is noted that about 13% of total investment made by these institutions is geared towards ethical investment funds which can be used to finance sustainable construction projects because it helps save the environment (Michelson *et al.*, 2004). There is an increased body of literature on Ethical Investments across a range of disciplines (see Lewis and Mackenzie, 2000; Woiceshyn, 2011; Traaseth *et al.*, 2017). Ethical Investment also is known as Socially Responsible Investment is a new concept where investors base their decisions on a different investment portfolio is on ethical values, social considerations as well

as the environmental concerns and not just financial calculations on when the investment can be recouped before investing in any venture of business (Youssef and Whyte, 2016).

According to Rimmer (2016), some foundations and charities namely the Rockefeller Brothers Foundation, KR Foundation and Leonardo DiCaprio among a host of other foundations are diverting their investment from ventures that affect the environment to projects that have an alignment to their ethical values. Ethical investment is one of the areas gradually gaining grounds in the financial sector. In the United Kingdom, private sector pension funds are legally obliged to consider the socially responsible investment as part of their overall investments portfolio's (Sparkes, 2001). The European Bank for Reconstruction and Development as part of its Ethical Investment drive has selected specific industries it does not invest in because they think their activities are not sustainable and cause harm to the environment (EBRD, 2016).

The number of trust of ethical investors is on the rise recently, and evidence shows that the performance of ethical funds can be financially valuable for customers (Shipochka, 2013). According to WWF (2012), customers who are concerned with where their funds are invested can deposit it into a savings account of sustainable banks which focuses on lending to firms and institutions that invest in sustainable construction projects that conserve the environment.

2.4.3 Corporate Image

Enshassi and Mayer (2005) defined a corporate image as the perception of an entity in the eyes of stakeholders involved with the entity. According to Ross (2014), issues of sustainable development has reached critical levels in recent times, and thus has made a lot of companies around the world to adjust their corporate images and showcase their environmental integrity by buying into the idea of issuing or investing in green bonds which are used to finance sustainable construction projects. The statement by Ross (2014) was backed by a report on green bonds by the Enerst and Young group that one of the significant drivers of issuance of

green bonds by companies is to enhance their brand as an environmentally conscious organisation (EY, 2015). As noted by Della Croce et al. (2011), investors improve their reputation by showing concern for the environment by investing in sustainable construction projects. Inderst et al. (2012) noted that one of the motivators for the financing of sustainable construction by an investor or company is to improve its reputation and also be able to market itself.

According to Hillestad et al. (2010), there has been an increased focus on corporate branding in order to stay competitive. In the Netherlands for instance, key banks participate in the government's green fund scheme which supports projects like sustainable construction projects because consumers demand it and it gives the bank also an improved image regarding environmental issues (Thornley *et al.*, 2011). Investors are continuously looking to keep up their image or brand in the wake of several appeals to have sustainable projects. Therefore as part of their corporate social responsibilities finance projects which are sustainable so that they are perceived helping improve the environment (Fontaine, 2013). A survey to find out the drivers for businesses in Hong Kong investing in environmental initiatives or adopting environmentally friendly practices revealed that doing so improves the reputation of the company (Studer et al., 2006). Diyana and Abidin (2013) noted that acquiring a green certification for a project enhances the public image of the stakeholders involved as we all strive towards conserving the environment.

2.4.4 Emerging Business Opportunity

According to Lotfi et al. (2018), environmental concerns raised over the years and also awareness created for consumers to buy or use green products has brought about several business opportunities in different fields, and the construction industry is one of them. The International Finance Cooperation is one of such investors taking advantage of the emerging business opportunities by investing in sustainable projects. The investment is in companies that

manufacture sustainable building materials (IFC, 2010). Investors are taking advantage of the incentives such as tax grants and other financial and regulatory incentives provided by governments to diversify into sustainable construction projects in order to maximise profits (Yudelson, 2012). Several studies have shown how stakeholders are taking advantage of the incentives been introduced to invest in sustainable construction projects (Zhang et al., 2011; Gündoğan, 2012; Mathews, 2015; Zhang *et al.*, 2017)

2.4.5 Reduced Lifecycle Cost of Project

According to Dwaikat and Ali (2018), life cycle costing is an appraisal tool used to evaluate different investments by taking into consideration the cost and savings along a specific period. It is basically to check the cost of owning a facility. The International Standard ISO 15686-5:2008 which throws light on the details of the life cycle of a building. It categorised the life cycle cost of a building into four groups namely (1) design and construction cost, (2) operational cost, (3) maintenance cost and (4) end life of cost (Dwaikat and Ali, 2018a). According to Fletcher (2009), apart from the environmental benefits of sustainable buildings, another benefit that can be derived is the savings made due to the integration of water and energy-saving equipment which in turn reduces the life cycle cost of the project. As noted by Dwaikat and Ali (2014), a growing body of literature suggests that sustainable buildings outperform conventional buildings in many areas and one particular area is the economic aspect which is assessed using life cycle costing as an appraisal tool. A study conducted by Weerasinghe et al. (2017) on life cycle cost analysis of a sustainable building and traditional building in Sri Lanka showed that the life cycle cost of a sustainable building was 24-28% lower compared to traditional buildings. The same study also showed that the operational, maintenance and end life cost of a sustainable building was lower compared to a traditional building.

2.4.6 Conservation of Resources

Sustainable buildings incur contractors and buyers extra cost due to the use of sustainable building technologies and alternative materials in order to conserve resources, but the benefits of constructing sustainable buildings outweigh the cost of building (Neyestani, 2017). Judicious use of resources during construction is vital to achieving the aim of sustainable buildings or construction (Kakkar, 2014). Akadiri et al. (2012) noted that conservation of resources was the means of achieving more by using little. Strategies for resources conservation were energy conservation, material conservation, water and land conservation. Khosla and Singh (2014) argued that sustainability advocacy had changed our way of building; the aim now is to make the building energy efficient and also less expensive to operate and maintain. One of the significant benefits of sustainable buildings widely reported in the literature is the energy savings made. According to (Low et al., 2014), one of the significant drivers promoting the rise of sustainable buildings or retrofitting of old buildings to make them sustainable is the high cost of energy bills. Constructing sustainable buildings allows for the optimal use of resources such as raw materials, energy and water (Neyestani, 2017).

Among the several benefits of sustainable buildings, one of the significant benefits is the overall energy savings made due to the technologies used in the building to cut down on energy consumption (Gündoğan, 2012). Waidyasekara and Fernando (2013) noted that constructing sustainable buildings that are energy efficient reduce the burden on government budget to continually look at ways of adding energy infrastructure to current ones as a result of the low energy consumption of these buildings. According to (Shazmin et al., 2016), one of the incentives used to encourage more investment in the area of energy conservation is providing property tax rebates for such investors. Property tax incentives for investment in energy conservation is practised in the United States and other countries across Europe.

2.4.7 High Return on Investment

In Australia, a study conducted found out that retrofitting an existing building or leasing a commercial building deemed sustainable brought in a 10% return on interest compared to other commercial properties which are not sustainable (Low et al., 2014). Azizi *et al.* (2011) noted that with the advent of sustainable development drive across the world, developers sell commercial facilities with eco labels faster thereby encouraging more of them to invest in such properties. According to Andelin *et al.* (2015), developers and owners define the value of a property as the market value of their property which is determined by how attractive it is and the kind of facilities in the property. As noted by the WGBC (2013), the rental and occupancy rate of a property has a direct relation to its market value. An example is the Santiago Rising in Chile which is a LEED certified building built at a lower cost compared to a similar conventional high rise building and fully booked because of the environmental benefits and lower operating cost of the facility (WGBC, 2013). According to Construction (2008), sustainable buildings have high occupancy rates, which translate into higher asking rents, which in turn gives investors in such buildings a more significant amount of return on their investment. Return on investment is as high as 52% compared to non-sustainable buildings. A study by Choi (2009), noted that a LEED or energy star had higher occupancy and rental rate compared to non LEED or Energy Star facilities. There was also a year on increment on the rental and occupancy rate. Diyana and Abidin (2013) noted that as a result of special features in sustainable construction projects, it attracts more buyers, thereby increasing the profitability of stakeholders involved.

2.4.8 Mandatory Legislation and Standards

According to Alsanad (2015), one of the factors that have driven the Kuwait market for sustainable construction projects has been the introduction of legislation by the government to encourage more of such projects. Darko *et al.* (2018) noted that the construction industry

introducing standards as to how construction is done going forward by implementing sustainable construction practices was a way of driving interest in investors investing in the sector knowing well that their projects adhere to standard to conserve the environment. Land use regulations and urban planning policies were one of the significant driving forces used to increase participation in the Greek sustainable construction sector (Manoliadis et al., 2006). According to Azizi *et al.* (2011), the impact of global pressure on governments across the world is making them put a premium on formulating legislation that moves the construction industry towards sustainability. In Hong Kong, one of the drivers been used to promote financing and participation in sustainable construction projects was the implementation of regulations that will encourage stakeholders in the construction industry to make environmental changes to their operations. Table 2.2 below shows a summary of the drivers identified from an extensive literature review conducted and their sources.

Table 2.2 Summary List of Drivers Identified in Literature

| CODE | DRIVERS | REFERENCES |
|-------------|-------------------------------------|---|
| DV1 | Corporate Social Responsibility | (Diyana and Abidin, 2013),(Franc et al., 2006) <i>McWilliams and Siegel, (2001)</i> ,(Nguyen, 2014) (O'Mara and Bates, 2012), <i>Orlitzky et al. (2006)</i> ,(Soundarrajan and Vivek, 2016) (Sullivan and Gouldson, 2016) |
| DV2 | Ethical Investment | (EBRD, 2016),(<i>Lewis and Mackenzie, 2000</i> , (Michelson et al., 2004) (<i>Rimmer,2016</i>),(Shipochka, 2013) (Sparkes, 2001), <i>Traaseth et al., 2017</i>), <i>Woiceshyn, 2011</i> ,(WWF, 2012) (Youssef and Whyte, 2016) |
| DV3 | Corporate Image | (Diyana and Abidin, 2013) <i>Enshassi and Mayer (2005)</i> ,(EY, 2015), (<i>Fontaine,2013</i>), (<i>Hillestad et al., 2010</i>), <i>Inderst et al. (2012)</i> ,(Ross, 2014), (<i>Studer et al., 2006</i>),(<i>Thornley et al., 2011</i>) |
| DV4 | Emerging Business Opportunity | * h 1 ' 2 ö \$ 1 (IFC, 2010),(<i>Lotfi et al., 2018</i>), <i>Mathews, 2015</i> ,(Yudelson, 2008a),(<i>Zhang et al., 2011</i> , <i>Zhang et al., 2017</i>) |
| DV5 | Reduced Life Cycle Cost | (Dwaikat and Ali, 2014) (Dwaikat and Ali, 2018a) (Fletcher, 2009) (<i>Weerasinghe et al., 2017</i>) |
| DV6 | Conservation of Resources | (* h 1 ' 2 ö \$ 1), (Kakkar, 2014),(Khosla and Singh, 2014) (<i>Low et al.,2014</i>),(Neyestani, 2017) (<i>Shazmin et al., 2016</i>), <i>Waidyasekara and Fernando (2013)</i> |
| DV7 | High Return on Investment | (<i>Andelin et al., 2015</i>),(<i>Azizi et al., 2011</i>), (Choi, 2009), (Construction, 2008) (Diyana and Abidin, 2013) (<i>Low et al.,2014</i>) (WGBC, 2013) |
| DV8 | Regulations, Standards and Policies | (<i>Alsanad, 2015</i>),(<i>Azizi et al., 2011</i>) <i>Darko et al. (2018)</i> (<i>Manoliadis et al., 2006</i>) |

2.5 BARRIERS TO IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION FINANCING

This section discussed the various factors that are barriers to the implementation of sustainable construction financing. Some of the barriers identified that may impede the financing of sustainable projects in the construction industry are presented, including the following: Lack of credible database, cost barrier, risk barrier and split incentive.

2.5.1 Lack of Credible Information Database

Notwithstanding the progress made globally to advocate for sustainable construction projects to save the environment, lack of information or knowledge has been one of the significant barriers to increased investment and capital mobilisation for such projects (GreenClimateFund, 2017). According to UNEPFI (2010), understanding of sustainable construction projects in the financial sector is limited thereby making it difficult for the professionals in the finance sector to deal with the financing affairs of sustainable construction projects. Some financial institutions are freezing their investment in sustainable construction projects until financial returns, and other benefits are proven due to the relative lack of consistent, accurate analysis and data interpretation, and this is proving to be one of the significant barriers to more rapid financing of sustainable construction projects (Weber et al., 2016).

Volz (2018) in his article *Fostering green finance for sustainable development in Asia* reinforced the fact that only a few professionals in the finance sector had information or knowledge on sustainability issues which they can use to advise or inform investors on the profitability of financing sustainable construction projects. Most financial professionals are unaware of the importance of sustainable development in their work (Malina, 2013). It has been noted by Clark et al. (2018) that, lack of information and inconsistent data on investment in a sustainable construction project can lead to risky financial decisions on such projects with regards to the returns on the investment. According to Sethi *et al.* (2017), crucial data and

information required to undertake the necessary financial appraisal of sustainable construction projects evaluation currently not available or is merely insufficient. GreenFinanceTaskforce (2018), also noted this point in their report to the United Kingdom government about how to accelerate green finance. It stated that investors and companies make their funds available when they can make informed decisions based on the data available. A study by Qian and Chan (2010), lack of vital information on sustainability in the construction is one of the critical factors hindering the growth of the construction industry when it comes to implementation of sustainable practices.

2.5.2 Cost Related Barrier

The perception out there that is that cost of sustainable construction projects is higher than that of a traditional building, and this hinders the promotion of financing of sustainable construction projects (Abdin and Azizi, 2016). According to Marsh Report (2009), financial risk ranked number one on their list of top five various risks associated with sustainable buildings. Some of the factors that accounted for increased risk in financing such projects include failure to secure incentives and grants as part of the project, cost of the certification process, increased risk of delay because the building is sustainable and ignorance of lenders and financial markets concerning sustainable projects. One of the significant barriers to sustainable construction project financing is the perceived high cost of construction of such projects (Yudelson, 2010). UNEPFI (2010) also noted that liability and litigation risk related to sustainable construction projects could potentially discourage some in the financial sector from possessing, financing, or lending for sustainable construction projects. Dwaikat and Ali (2016) also noted that sustainable construction projects could outperform conventional buildings in many performance areas. Nonetheless, the perceived higher upfront cost by building owners and investors is one of the significant barriers to the financing of sustainable construction projects (Ross, 2014).

Developers and contractors perceive there is a risk of failure in the application of technology or materials which make a building sustainable is likely to fail thereby putting fear in investors there is little chance of making profits on their investment in sustainable construction projects (Bradshaw *et al.*, 2005). This phenomenon has led to many investors not investing because high upfront costs for such projects and the rate of return is not attractive enough to enable them to invest (Lee *et al.*, 2013). One of the significant challenges for developers for undertaking sustainable construction developments is that they may not know if they can get their investments back in a specific period (Leung *et al.*, 2013). Another area that is preventing much investment in sustainable construction projects is the high cost of certification. A 2008 Green Building Market Barometer report by Turner Construction, one of the barriers to sustainable development is the high cost of LEED certification (Construction, 2008).

As noted by Adamson *et al.* (2016) from their analysis of LEED certification cost, the cost of one certifying a construction project under LEED can take up to 1%-5% of the overall project cost. The cost of administering EDGE certification in Ghana costs between US\$ 8,730 and US\$ 9,350.00 to get a building certified according to EDGE standards (IFC, 2017b). Nordin *et al.* (2017) argued that another perception which developers in Malaysia have is the cost of obtaining certification for projects which adds up to the initial cost of investing in the project. Another significant risk that a sustainable construction project is faced with is the issue of materials and technology not having insurance due to the lack of adequate testing (Odom *et al.*, 2008).

2.5.3 Risk-Related Barriers

Ashuri and Durmus-Pedini (2010) noted that the construction of a sustainable project might face not only financial risks but also other risks such as performance, legislative, industry and market risks. Sustainable construction projects come with legal risks where the project does not meet the level of green certification expected. A classic example is the case “Southern

Builders Inc. vs Shaw Development LLC, Case No. 19-C-07-011405 (Md. Cir. Ct. 2007)” which was one of the first green building lawsuit in the United States (Azizi *et al.*, 2011). Drafting contracts for the construction of such projects can also be an issue because parties look at taking on less risk in case of failure of the project(Odom et al., 2008).

Azizi *et al.* (2011), also noted there was the chance of regulatory risks if government priorities changed by maintaining regulations for sustainable projects but removed incentives. A report by Zurich (2010), noted that there was the possibility of regulatory risk as a result of new codes and regulations certifying sustainable projects, there is the risk of increased liability for parties involved in the construction process. In the case of performance risk, (Zurich (2010) noted that many industry practitioners viewed the performance of materials, systems and its implementation in the buildings as a risk. Studies have shown that some LEED certified buildings were outperformed by conventional buildings in the area of energy savings (Cohen *et al.*, 2001; Newsham *et al.*, 2009). Market related risks, for instance, are caused as a result of a lack of knowledge concerning issues to do with sustainable construction (Ashuri and Durmus-Pedini, 2010).

2.5.4 Barrier of Split Incentives

According to Bird and Hernadez (2012), a split incentive is a circumstance where investments and benefits are not allocated equally among users and developers, which slows the rate of investment in energy-saving technology. The situation where the benefits that accrue from an investment do not go to the party that financed it, but rather another party enjoys the interests of the investment is known as split Incentive (Wilkinson and Bonde, 2012). Sourani and Sohail (2011) also noted that quite often the party responsible for capital investment is not the same party that reaps the benefits during the operational life cycle of the building. Therefore the parties are not interested in investing in such a project.

This situation is mostly related to cost recovery of energy efficiency upgrades due to the failure of allocating effectively financial obligations and rewards of these investments between concerned parties and may trigger inaction from both parties even though the investment may present positive results (Economidou, 2014). Apart from this barrier been identified in the literature, a study conducted in California among property developers showed that many building owners were not ready to invest in energy retrofiting because the benefits go to the end-user of the building when their energy bills are reduced (Dyson, 2010).

In this case, it becomes such an issue that the party who is supposed to finance improvement to the project then decides not to do so again since they are not going to benefit from the upgrade of the project to make it sustainable (New South Wales Government, 2013). The issue of split incentives is not limited to financial institutions but rather a barrier to any stakeholder interested in the construction of sustainable projects (UNEPFI, 2010). According to Charlier (2012), the split incentive may also arise as a result of low income of tenants who are not able to invest in sustainable technology to make their facility sustainable and in some situations, clients know they do not reap any benefits of any sustainable technology install to ensure low energy bills. The situation brings about some uncertainty between the client and tenant about their investment.

2.5.5 Lack of Policy Direction and Regulatory Gaps

Research into the barriers that impede financing of the sustainable construction project has shown that one of the significant barriers not promoting the financing of such projects is the lack of a clear cut policy for the financing of sustainable construction projects and regulatory gaps (Soundarrajan and Vivek, 2016). In the United Kingdom, for instance, Sourani and Sohail (2011) noted that commitment to introducing policies, regulations currently by leadership in the UK might not be enough to push through the financing of sustainable development projects. Private investors, for instance, require confidence in the market that their investments are safe since reaping of investment in sustainable projects is a long term, and this can only be achieved if there are adequate policies in place (Lehman *et al.*, 2015). According to GreenClimateFund (2017), the regulatory and policy barrier was caused by a lack of consistent policy, lack of appropriate strategic regulatory framework and lack of support from governments for matters concerning the financing of sustainable projects.

In Asia, countries are making efforts to ensure that there are suitable policies in place to enhance the financing of sustainable construction projects by introducing sustainable financing guidelines and regulations (Volz, 2018). According to the (GreenClimateFund, 2017), two other countries making efforts to ensure there are policies and guidelines in place that attract private investment in sustainable finance projects are Kenya and Ethiopia. As noted by Nakhoda (2013), a lot of developing countries are making efforts to get policies and regulations concerning sustainability and its financing, but the issue they face is the implementing bodies cannot enforce these regulations and policies in other to improve the financing of sustainable projects. Climate Transparency (2017) noted that private funds are abundant in the system but can only be directed towards the financing of a sustainable construction project if policies and regulation.

2.5.6 Lack of Knowledge among Professionals

As noted by Durdyev *et al.* (2018), sustainability issues have been widely reported in the literature and one key issue that has been cited by researchers in different countries has been a hindrance is the issue of the level of knowledge on sustainability issues. According to Volz (2018), only a few professionals in the finance sector had information or knowledge on sustainability issues which they can use to advise investors on the profitability of financing sustainable construction projects. Most financial professionals are unaware of the importance of sustainable development in their work (Malina, 2013).

To ensure the success of the implementation of sustainability in the construction industry where different actor come together to ensure the success of a project, it is crucial professionals are well-informed with knowledge (Ametepey *et al.*, 2015). Literature has shown that even though significant levels of investments are made in sustainable development, many professionals who find themselves working in sectors having a relationship with sustainable project's do not have adequate knowledge resulting in lack of consistent measurement and potentially undervaluing sustainable projects (UNEPFI, 2010). According to UNEPFI (2010), some institutions are making efforts to have their staff educated on sustainable construction projects issues. One of such is PNC bank educating their loan officers

2.5.7 Insufficient Government Support

Ametepey *et al.* (2015) noted that one of the main barriers affecting the implementation of sustainable construction in Ghana is the lack of support from the government. Without this support, it becomes challenging to attract or sustain interest in the financing of such projects. According to (Deng *et al.*, 2016), in the absence of government providing incentives to support developers and investors, very few of them direct investment into sustainable construction projects for the sole purpose of environmental sustainability. Offsetting the initial higher cost of sustainable buildings is only possible when governments provide fiscal incentives to

stakeholders interested in developing sustainable buildings because the perceived cost leads to the unattractiveness of this sector (Deng *et al.*, 2016).

The government can also ensure that there is enforcement of stringent environmental regulations guiding the building sector in order to attract more interest in sustainable buildings. The interest drives up the level of investment in order to create more sustainable construction projects (Alsanad, 2015). Alsanad (2015) noted that the majority of stakeholders believe government providing rewards and incentives to consumers, and the construction industry helps sustain investment in sustainable construction projects.

2.5.8 Inadequate Financing Schemes

Construction is a capital intensive venture that requires much financing. Lack of funds to invest in sustainable building projects has been noted as one of the barriers impeding the implementation of sustainable practices in the construction industry (Ametepey *et al.*, 2015). According to Gou *et al.* (2013), obtaining financing from banks can be challenging for developers of sustainable construction projects, making it difficult for investors and developers to increase their investment in the area. One of the significant barriers to increased investment in sustainable buildings in Malaysia is the lack of financial resources to cover the initial higher upfront cost of such projects (Samari *et al.*, 2013). Lack of financing mechanisms to fund sustainable projects has significantly challenged the industry from expanding the number of sustainable construction projects (Qian and Chan, 2010). According to Choi (2009), one of the reasons that make it difficult to secure funding for sustainable construction projects is that evaluation criteria are usually geared towards conventional development and not sustainable development. Table 2.3 below shows a list of barriers identified from the literature.

Table 2.3 Summary List of Barriers Identified from Literature

| CODE | CRITICAL BARRIERS | REFERENCES |
|-------------|--|--|
| BR1 | Lack of Information and Inconsistent Data | (Clark <i>et al.</i> , 2018), <i>GreenFinanceTaskforce (2018)</i> ,(GreenClimateFund, 2017), (Malina, 2013), (Qian and Chan, 2010), <i>Sethi et al.</i> , 2017),(UNEPFI, 2010), <i>Volz(2018)</i> .(Weber <i>et al.</i> , 2016) |
| BR2 | Cost Related barrier (e.g. High upfront cost, short payback period.) | (Abdin and Azizi, 2016), (Adamson <i>et al.</i> , 2016),(Leung <i>et al.</i> , 2013),(Construction, 2008), (Bradshaw <i>et al.</i> , 2005), <i>Dwaikat and Ali (2016)</i> , (Lee <i>et al.</i> , 2013),(Marsh Report, 2009), (Nordin <i>et al.</i> , 2017) ,(Odom <i>et al.</i> , 2008) , (Ross, 2014),(UNEPFI, 2010), (Yudelson, 2010) |
| BR3 | Risk Related Barriers | (Ashuri and Durmus-Pedini, 2010)(Azizi <i>et al.</i> , 2011) ,(Cohen <i>et al.</i> , 2001),(Odom <i>et al.</i> , 2008), <i>Newsham et al.</i> , 2009) (Zurich, 2010) |
| BR4 | Barrier of Split Incentive | (Charlier, 2012),(Dyson, 2010),(Economidou, 2014), (Bird and Hernadez, 2012), (New South Wales Government, 2013), <i>Sourani and Sohail (2011)</i> ,(UNEPFI, 2010),(Wilkinson and Bonde, 2012) |
| BR5 | Lack of policy direction and regulatory gaps | (GreenClimateFund, 2017),(Lehman <i>et al.</i> , 2015) (Nakhoda, 2013), <i>Sourani and Sohail (2011)</i> , (Soundarrajan and Vivek, 2016), <i>Volz(2018)</i> ,(Climate Transparency, 2017) |
| BR6 | Lack of Knowledge among Professionals | (Ametepey <i>et al.</i> , 2015), (Durdyev <i>et al.</i> , 2018),(Malina, 2013),(UNEPFI, 2010) <i>Volz (2018)</i> |
| BR7 | Insufficient Government Support | (Alsanad, 2015) <i>Ametepey et al.</i> , 2015 (Deng <i>et al.</i> , 2016) |
| BR8 | Inadequate financing Schemes | <i>Ametepey et al.</i> , 2015, (Choi, 2009) (<i>Gou et al.</i> , 2013)(Samari <i>et al.</i> , 2013) |

2.6. STRATEGIES TO PROMOTE FINANCING OF SUSTAINABLE CONSTRUCTION PROJECTS

Mintzberg (1987) defined strategy as a set of guidelines designed to deal with a situation. According to Darko and Chan (2018), Mintzberg definition of strategy means that strategy has two characteristics. They are designed purposefully and also developed in advance of the actions to which they apply. (Ferreira et al., 2014) noted that strategy could mean policies, programs, policies depending on the context it is used in order to achieve set objectives. This section of the work outlines critical strategies identified from an extensive literature review that can promote the financing of sustainable construction projects. Other strategies were identified during the literature review, which was similar, but the eight strategies discussed were mentioned most in almost all the literature reviewed hence the decision to select them.

2.6.1 Credible Information Database

According to Noh (2010), having easy access to information database on cost, the risk associated with sustainable construction projects makes it easy for developers and investors to make a decision when they want to invest in such projects. Chan et al. (2009) argued that having such a database was vital and critical since all decisions made to invest is based on the information available in the database. As noted by Hwang and Tan (2012), investors are usually interested in making decisions based on numbers and information available to them, therefore, the need for an agency to be established to record such vital information. Different research works done in the area of sustainability in the construction sector have made recommended measures that can help drive up interest. One of the research works is by (Soundarrajan and Vivek, 2016), one of the critical measures proposed to drive up investments is to have a policy where critical information is recorded to make it easy for investment decisions to be made. These points stated above were also echoed in GreenFinanceTaskforce (2018) report on ways to accelerate sustainability financing, because, without a robust database, it becomes

complicated for stakeholders to commit to investing. A comprehensive risk management plan must be developed to take care of the variance between conventional and sustainable building projects (Hwang *et al.*, 2017). A recent study by Darko *et al.* (2017), showed that one of the strategies for promoting sustainable projects is the availability of information on costs, risk and benefits of such projects to encourage investment been directed to such projects. The importance of the information database on sustainable construction projects is critical in driving up interest and investment in sustainable construction project financing. Information may include cost analysis, return on interest, payback period, benefits, insurance and risk associated with such projects in order to accurately inform stakeholders with regards to decision making is highlighted in the following studies (see Chan et al., 2009; Potbhare et al., 2009; Li *et al.*, 2014).

2.6.2 Government Support

Governments all over the world have significant roles to play in order for each sector in their countries to thrive and be successful. The government needs to channel much support to the construction industry in order for it to succeed. According to Soundarrajan and Vivek (2016), in order to attract maximum investments into a country's construction sector. The government must help stakeholders interested in investing in such ventures. Without such help, it is difficult for stakeholders interested in investing in sustainable construction projects, for instance, to succeed because of the challenges encountered with such ventures (Shan et al., 2017). Hwang and Tan (2012a) proposed interest free lending scheme by the government as a way of solving issues related to sustainable construction projects as this affords the investors the chance to cover up higher initial capital cost. Governments can play a lead role by offering support to stakeholders in sustainable construction through economic incentives, policy decisions and being an advocator by supporting more extensive education of the public on the benefits of such projects (Qian and Chan, 2010). A primary driver of sustainable development is the

Government. Policies, regulations and actions of the government will encourage industry practitioners to take voluntary decisions that promote financing the sector with regards to sustainable development (Zhang, 2015). This strategy is enforced by Yeatts *et al.* (2017); it was noted that regulations and policies had had an increase in the investment in sustainable development in two Australian cities as these legislations lead to changes in personal and organisational behaviours.

2.6.3 Positioning Financial Sector to Handle Sustainability Issues

According to Lützkendorf *et al.* (2011), financial stakeholders are key to sustainable development, and that can only happen when appropriate market conditions are available. The financial industry has a significant role to play in the implementation of sustainability in the construction industry thus their practices must be aligned in such a way to make it easy for them to invest in sustainable construction projects (GreenFinanceTaskforce, 2018). According to Lemmet *et al.* (2017), one of the strategies been used by the French is to ensure their financial institutions limit their investment in fossil fuel products and channel the freed-up capital into sustainable construction projects. The financial industry indirectly contributes to the destruction of the environment through the funding of entities whose activities flout environmental regulations (Bhardwaj, 2013). Bhardwaj (2013) noted that the financial sector could play a role in increased investment in sustainable projects by diverting their interests in projects that implement sustainability practices. Financial organisations play a crucial role in infrastructure development; their credit policies can significantly influence the level of investment in sustainable development projects (Zhang, 2015).

2.6.4 Training and Education

Noh (2018), stated that one of the ways of increasing investment in sustainable construction projects was the education of the public on the benefits of sustainable construction projects and why more of such projects are needed. He also emphasised that professionals involved must be

educated on current trends and practices in order for them to competently deliver. Hwang *et al.* (2017), noted that there is a need for course material to be developed to provide adequate training to personnel for them to appreciate the knowledge they are acquiring. Darko *et al.* (2017) study showed that one of the most important strategies for promoting green building was educating developers, contractors and policymakers are stakeholders in sustainability in the construction industry can drive interest in the financing of sustainable construction projects. Professional bodies related to the construction industry and the financial sector, academia, NGO's and government agencies must ensure the general public is educated on the benefits of sustainable construction projects and how it improves their standard of living and reduction in cost during the operational stage of such projects (Chan et al., 2009). Several studies have strongly supported the idea of educating stakeholders on the need to shift towards the financing of sustainable construction projects and the benefits we can reap from it (see Potbhare et al., 2009; Gan *et al.*, 2015). Potbhare et al. (2009) noted that educating professionals involved, as well as the general public, was a strategy that could attract more investment.

2.6.5 Legal framework for Sustainable Construction

Environmental policies and guidelines are essential for the construction industry. Developing one to guide projects attracts investments into such projects (Soundarrajan and Vivek, 2016). According to Hwang and Tan, (2012a) and Hwang *et al.* (2017), policies must be formulated to guide the industry to regards to sustainable construction projects. These policies instil confidence in those who are interested in investing in such projects. Gou et al. (2013) noted how individual governments around the world had taken the lead by ensuring particular government infrastructure apply the country's rating tool to ensure such projects are sustainable. Such a policy draws the private sector since the government has taken the lead in ensuring its policies are implemented. It is necessary to formulate policies that make administrative procedures simplified instead of the usual time-consuming process construction

projects go through to obtain permissions (Wong et al., 2016). Qian and Chan (2010) in their study recommended the idea to formulate mandatory policies and standards to guide the industry and market related to sustainable projects and financial penalties to punish noncompliance of such laws and policies. Policies that undermine the growth of sustainable development must be identified and removed in order to encourage investment in infrastructure in line with sustainable development and green goals (Merk *et al.*, 2012). Studies by (Mulligan *et al.*, 2014; Darko *et al.*, 2017; Darko et al., 2017) have highlighted the need for strict and mandatory regulations and standards with regards to sustainable construction projects that inherently compel stakeholders to implement more green practices with a cascading effect of attracting investment. According to Gou et al. (2013), the U.S governments way of increasing investment and participation in sustainable construction was to formulate policies that rewarded such participants with financial incentives and rewards. Most legislation regarding the construction sector is outdated; hence, the need to update them to reflect the needs of the present generation (Shi *et al.*, 2013). Rating tools and standards used to asses projects must be consistent to avoid the confusion of which tools are more sustainable than the other; this encourages more investment (Li *et al.*, 2014). Potbhare et al. (2009) proposed that there should be an institutional framework that ensures that all guidelines and policies are implemented effectively.

2.6.6 Financial and Other Market Incentives for Sustainable Building Adopters

According to Azeem *et al.* (2017), stakeholders who adopt sustainable construction practices need financial incentives and other market related incentives to ensure increased investment. Gou et al. (2013), stressed on the need for financial incentives for sustainable building adopters, grants, subsidised loans, tax exemptions are some of the incentives that can be used to encourage the financing of more sustainable projects. Hwang and Tan (2012a) noted that one of the market related incentive is to impose more substantial taxes and penalties on non-

sustainable projects which will force investors to turn to sustainable once since the non-sustainable projects become unattractive. According to Darko *et al.* (2017) and Darko *et al.* (2017), incentives in any form for sustainable construction project developers and investors will accelerate the number of projects and investment directed to the sector currently. Setting up of reward schemes to reward stakeholders involved in sustainable construction projects becomes one of the most attractive incentives to draw more investment to such projects (Qian and Chan, 2010). Other non-financial related incentives can be granted to stakeholders interested in sustainable construction by having their administrative processes expedited to ensure effective implementation of sustainable practices knowing very well that their projects have time related risks (Olubunmi *et al.*, 2016). Incentives such as tax reliefs, grants and other low cost loan schemes can help stimulate the interest in sustainable construction project financing because of the long term benefits to be enjoyed due to the incentives (Potbhare *et al.*, 2009). A study by Olubunmi *et al.* (2016) and Qian *et al.* (2016), noted that providing regulatory and administrative incentives are actions that stimulate sustainable construction projects and motivate developers to meet high standards to draw in more financial investments.

2.6.7 Research on Sustainable Construction and its Financing

The gap in knowledge concerning sustainable construction projects and its benefits must be bridged, one way of doing this is to encourage more research work by academia for the benefit of the general public in order to attract high investments because of the perceptions stakeholders have about such projects (Yean *et al.*, 2011). According to a study by Zuo and Zhao (2018), the current research trend on sustainable construction has focused more on the environmental aspect highlighting its benefits instead of taking a triple bottom line approach of looking at all the three aspects of sustainability. Studies have shown, economically sustainable construction projects provide immense savings during the operational stages and also have less maintenance cost due to some of the energy-saving technology used (Popescu *et*

al., 2012). According to Li *et al.* (2014), one of the ways of promoting sustainable buildings is to ensure the is research to enable interested parties to have access to information that can educate them and make them invest in sustainable construction projects going forward.

2.6.8 Market for Sustainable Construction Products

In order to encourage more investment in sustainable construction projects, there is a need to create a market that absorbs such products (Soundarrajan and Vivek, 2016). According to Myers *et al.* (2008), the market for sustainable construction projects can be encouraged through government Legal framework for Sustainable Construction which attracts investors into the area. Even though the market for sustainable projects is still growing, there is a need to create a conducive environment that encourages consumers to have an interest in more of such projects (Zhang *et al.*, 2011). Increasingly, the demand for sustainable construction projects has improved as a result of tenants and investors are becoming aware of the benefits they can both derive from such projects (Nelson, 2007). Table 2.4 shows a summary of strategies for the promotion of sustainable construction project financing.

Table 2.4 List of Strategies for Promotion of Sustainable Construction Project Identified from Literature

| CODE | PROMOTION STRATEGY | REFERENCES |
|-------------|--|--|
| ST1 | Credible Information Database | <i>Chan et al. (2009), (Darko et al., 2017), (GreenFinanceTaskforce, 2018), (Hwang et al., 2017), (Hwang and Tan,2012), Li et al., 2014), (Noh,2010), Potbhare et al., 2009, (Soundarrajan and Vivek, 2016)</i> |
| ST2 | Government Support | <i>Hwang and Tan (2012a), (Qian and Chan, 2010), (Shan et al., 2017), (Soundarrajan and Vivek, 2016), (Yeatts et al., 2017), (Zhang, 2015)</i> |
| ST3 | Alignment of the Financial Sector | <i>Bhardwaj (2013), (GreenFinanceTaskforce, 2018), (Lemmet et al., 2017), (Lützkendorf et al., 2011), (Zhang, 2015)</i> |
| ST4 | Training and Education | <i>Chan et al., 2009; (Darko et al., 2017), Gan et al., 2015, Noh (2018), Potbhare et al., 2009;</i> |
| ST5 | Legal framework for Sustainable Construction | <i>(Darko et al., 2017), (Darko et al., 2017),Gou et al. (2013), Hwang and Tan (2012a), (Hwang et al., 2017), Li et al., 2014), Merk et al., 2012), (Mulligan et al., 2014, Potbhare et al., 2009, (Qian and Chan, 2010), (Shi et al., 2013, (Soundarrajan and Vivek, 2016), (Wong et al., 2016)</i> |
| ST6 | Incentives (e.g. tax grants, low property rates, low-interest rates) | <i>(Azeem et al., 2017), (Darko et al., 2017), (Darko et al., 2017) Gou et al. (2013), Hwang and Tan (2012a), (Olubunmi et al., 2016), Potbhare et al., 2009, (Qian and Chan, 2010),Qian et al.,2016</i> |
| ST7 | Research on Sustainable construction and its financing | <i>Li et al., 2014), (Popescu et al., 2012), (Yean et al., 2011), (Zuo and Zhao, 2018)</i> |
| ST8 | Market for Projects | <i>(Myers et al.,2008)(Soundarrajan and Vivek, 2016) (Zhang et al., 2011)</i> |

2.7 CHAPTER SUMMARY

This chapter presented a review of literature sustainability and sustainable development. It further reviewed the literature on sustainable construction, the Ghanaian construction industry and sustainability, project financing, and compared the cost of conventional construction to sustainable construction. The chapter also reviewed sustainable construction financing, the various forms of financing approaches for sustainable construction financing. A further review on drivers of sustainable construction project financing was done as well as barriers to the implementation of sustainable construction project financing. Lastly, strategies for the promotion of sustainable construction project financing was reviewed to complete the literature review section of this work.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter introduces the philosophical standpoint of the research, the research strategy employed, the type of research methodology used and the various research tools and procedures used to collect and analyse data to achieve the objectives of the research. Saunders et al. (2009), noted that the direction of every single research work is grounded on the philosophical viewpoint adopted, the research strategy, research method, research instruments, and procedures used to collect and analyse data. This chapter is essential because it describes how the solution to a particular research problem was achieved.

3.2 PHILOSOPHICAL CONCEPT

According to Bryman (2016), research philosophy is concerned with a set of beliefs related to the nature of reality being examined. It is the basic definition of the nature of knowledge. In conducting research, there must be an understanding of what to learn, how to learn it and why it is essential to learn it and is reinforced by a particular philosophical assumption (Creswell, 2009). Philosophical assumptions determine the strategies and methods that were used to carry out the research work (Saunders et al., 2009). Krauss (2005) noted that the research paradigm or philosophical standpoint adapted for research dictates the research methodology, methods and design applied. Guba and Lincoln (1994), defined research paradigm as a set of beliefs that deal with the ultimate. According to Saunders et al. (2009) and Kivunja and Kuyini (2017), the dominant research paradigms are pragmatism, interpretivism, and positivism.

3.2.1 Positivism

According to Ponterotto (2017), “positivism is a form of philosophical realism adhering strictly to the hypothetic-deductive method.” Positivists accept as real that science relies exclusively on observations and measurements (Tavakol and Zeinaloo, 2004). According to Kim (2003), positivism affirms that knowledge and truth are interrogations of correspondence in that they relate to an external reality.

Guba and Lincoln (1994) noted that positivism emphasizes on efforts to confirm a hypothesis that is most often stated in quantitative propositions and expressed into mathematical formulas stating functional relationships. The positivist paradigm emphasizes that actual events can be perceived empirically and described with logical analysis (Kaboub, 2008).

3.2.2 Interpretivism

The Interpretive paradigm (or constructivist) is perceived as an alternative to that of the positivist paradigm position. According to Ponterotto (2017), interpretivism follows to a relativist position that assumes various and equally valid realities. Hansen (2004) noted that interpretivism holds the position that reality is not an externally singular entity but instead created in the mind of individuals. Interpretivism looks for imports and explanations behind peoples actions like behaviour and communications with others in society and culture (Chowdhury, 2014). In principle, interpretivism as a philosophical and research paradigm is concerned with the uniqueness of a specific situation, contributing to the underlying pursuit of knowledge (Kelliher, 2011). The aim of the research with regards to the interpretive philosophy is to rely on the views of the contributors to the subject matter under study (Saunders et al., 2009). According to (Thanh and Thanh, 2015), interpretivism observes the world through the eyes of various individuals who have their understanding of a phenomenon hence they prefer using a qualitative method which is a means of exploring and understanding the meanings individuals ascribe to problems.

3.2.3 Pragmatism

According to Kivunja and Kuyini (2017), the pragmatism paradigm was established as a result of philosophers who claimed that it was not probable to access the truth about the real world solely by virtue of a single scientific method as supported by the positivist paradigm, nor was it possible to conclude social reality as constructed under the interpretive paradigm. The pragmatist paradigm deals with action, intervention and constructive knowledge (Goldkuhl, 2012).

3.2.4 Adopted Philosophical Paradigm

From the above definitions of the various philosophical paradigms, the one which best fit for this research is that of the positivist. Positivism wants research to be generalizable, representative and also employs survey and quantitative research (Pham, 2018). In proposing strategies for the promotion of sustainable construction project financing, the researcher gathered the thoughts of professionals and interpreted them using a statistical formula to determine the importance of each strategy proposed.

3.3 RESEARCH APPROACH

According to Soiferman (2010), the two significant forms of reasoning used in undertaking research are inductive and deductive reasoning. Since a positivist paradigm is selected for this research, which supports the use of deductive reasoning, the deduction form of reasoning was discussed further in this section.

Meng (2002) and Ayalon and Even (2008) illustrated that deductive reasoning uses general theories and principles to determine a specific conclusion, therefore, making the conclusion accurate since it is based on a valid premise. According to Ayalon and Even (2008), deductive arguments preserve the truth in that if the premise on which the argument has been made is

true, then the conclusion is also accurate. Johnson-Laird (1999) noted that deductive reasoning is the process of making logical inferences

3.4 RESEARCH STRATEGY

The research strategy is the procedure by which the research is conducted (Wedawatta et al., 2011). In conducting research, the research strategy is the overall plan for conducting the research (Johannesson and Perjons, 2014). According to Saunders et al. (2009), the type of research strategy designated for research is centred on research question(s) and objectives, the level of existing knowledge, the amount of time and philosophical underpinnings of the research. Saunders et al., (2009) noted that the various types of research strategies are a case study, survey, experiment, grounded theory, action research archival and ethnography research. The strategy that was utilised for this research was that of the survey. According to Showkat and Parveen (2017), survey research is a well organised process through which information is gathered from people and allows for the study of the characteristics of the participants involved. Survey research is usually linked to the deductive approach of reasoning. It allows for the collection of quantitative data, which is analysed through descriptive of inferential statistics (Saunders et al., 2009). The selection of research strategy was influenced by the research questions, objectives and also the philosophical underpinning of the study. Also the time constraints had an influence on the selection survey research is less expensive form of gathering data.

3.5 RESEARCH METHODS

Research methods is a third major component of research that deals with methods for collecting and analysing data in research (Creswell, 2002). Creswell (2002) noted there are three types of research methods, namely quantitative, qualitative and mixed methods. The discussion centred on the three types of research methods used for research.

First, to be discussed under this section is quantitative methods. Yilmaz (2013) defined quantitative research as an investigation into a social phenomenon by the testing of an existing theory consisting of variables to determine if the theory explains the problem at hand. According to Muijs (2004), quantitative research is the explanation of a phenomenon through the use of analysis of data collected using mathematical methods. In quantitative research, it mainly focuses on measuring social reality, and quantitative researchers view the world as a reality which can be determined objectively (Sukamolson, 2007). Mundar et al. (2012) noted that this type of research method focused on the derivation of conclusions from existing data or theories. Creswell (2002) noted that developing knowledge in quantitative research is based on the ideas of a positivist. Quantitative methods focus on the strict quantification of observations and careful control of observed variables. It often integrates large scale sampling and the use of statistical procedures to examine group means and variances (Ponterotto, 2017). Abawi (2008) pointed out the fact that, in quantitative research, the researcher remains independent and distant from the subject under study, and this type of research aims to make a generalisation that contributes to theory in order for a researcher to explain a phenomenon. According Terrell (2012) quantitative research is associated with the positivist paradigm. There are several types of research conducted under the quantitative method.

Williams (2007) defined qualitative research as one that involves discovery, carried out in the natural setting, and the phenomenon is investigated from the viewpoint of the participants. According to Creswell (2014), a qualitative method to research requires the researcher to use the interpretations of views of participants to make sense of a phenomenon. Qualitative research involves an interpretive approach, and naturalistic settings thus study “things in their natural surroundings, attempting to make sense of, or to understand, phenomena in terms of the meanings people bring to them” (Denzin and Lincoln, 2005). Qualitative methods refer to a wide-ranging class of empirical processes aimed at describing and interpreting the

experiences of research participants in a context-specific setting. Its findings are generally presented in everyday language and often incorporate participants' own words to describe an event, experience, or phenomenon (Ponterotto, 2017). The researcher makes knowledge claims based on interpretivist perspective (Creswell, 2005). Williams (2007) and Mohajan (2018) noted that qualitative research has areas namely narrative, phenomenology, grounded theory, action research, case study, ethnography, historical research, and content analysis which are built upon inductive reasoning and its associated methodologies.

The last research method often used by researcher's is the mixed methods. Schoonenboom and Johnson, (2017) defined mixed method research as the adaptation of elements of qualitative and quantitative research approach such as viewpoints, data collection, and analysis and inference techniques for a broad purpose of in-depth understanding. Terrell (2012) noted that as a result of the argument on pragmatist paradigm, mixed methods is used to provide a better understanding of a situation instead of using the qualitative or quantitative methods.

Table 3.1 below documents the differences between quantitative research and qualitative research, as recorded in literature.

Table 3.1 Difference between Qualitative and Quantitative Research Methods

| | Qualitative | Quantitative |
|----------------------------|--|---|
| <i>Logic Employed</i> | Inductive; generation of theory | Deductive; testing of theory |
| <i>Underlying Paradigm</i> | Interpretivism | Natural science model in particular positivism |
| <i>Sample</i> | Uses small samples | Uses large samples depending on the objective of the research |
| <i>Instruments/Tools</i> | In-depth interviews, questionnaires, field notes and analysis of visual evidence | Use preselected, structured, and valid instruments like scales, tests, inventories and questionnaires |
| <i>Data Analysis</i> | Search for patterns, themes and holistic features | Mainly statistical analysis of numeric data and identify relations |
| <i>Results</i> | Particularistic findings representation of respondents multiple views | Generalizable findings |

Source : (Bryman, 2016), Johnson and Christensen (2004), and Vanderstoep and Johnston (2009) as cited in (Alamirew, 2009)

3.5.1 Adopted Research Method

Based on the underlying paradigm, logic, sample size, instrument for data collection and type of data analysis selected to be used for the research quantitative research method was used for the study. Also based on the research question and objectives of the study it was important to select quantitative research method because it allows for the quantification of opinions to generalise results from a larger group (Muijs, 2004). Statistical analysis is used to make a connection between what is known and can be studied in quantitative research. Quantitative research aids in achieving the goal of developing a generalisation that contributes to the theory, which allows for prediction, explanation and understanding of a phenomenon (Abawi, 2008).

3.6 RESEARCH POPULATION

Polit and Hunglar (1999) as cited in Ringui (2012) defined the population of the research as the totality of all subjects which conform to the set of specifications comprising of all person of interest to the researcher and to whom the results obtained can be generalised. Mugo (2002) noted that the population of the research is the larger group of persons, objects or items from which representative sample size is obtained. The population of this research consists of financial sector professionals and construction sector industry practitioners with experience and understanding of sustainable construction projects.

3.7 SAMPLING

Sampling is the procedure of selecting a representative portion of the target population for determining characteristics of the whole population (Mugo, 2002). According to Alvi (2016), the accuracy of inference and generalisation of the results is higher when there is a representative sample. Alvi (2016) noted that there are two types of sampling, namely, probability and non- probability sampling. Taherdoost (2016) defined probability sampling as the situation where every item or object or person in a population of having an equal chance of been selected. The types of probability sampling are simple random, stratified random, cluster, systematic and multi-stage sampling. Non-probability sampling was defined by Saunders et al. (2009) as the selection of sample based on biased sampling. The types of non-probability sampling are quota, snowball, judgement and convenience sampling.

This research made use of the non-probability sampling technique. The snowball sampling and purposive sampling techniques were utilised for this research work. Alvi (2016) revealed that purposive sampling is a technique where the researcher selects participants based on specific criteria or to achieve an aim by selecting those participants. The selection of these participants is to draw valuable information from them (Taherdoost, 2016). Purposive sampling was used to select professionals based on their experience and the field of work (Cohen et al., 2007).

Snowballing technique uses a few cases to encourage others to participate or direct the researchers to other participants who have valuable information concerning the research problem (Taherdoost, 2016). Most sustainable construction-related research in Ghana and outside the country has used the non-probability sampling technique for the research (see Mao *et al.*, 2013; Zhao *et al.*, 2014; Darko *et al.*, 2017; Darko and Chan, 2018). The sample size is the representative portion of a population selected to find information from participants through the use of sampling techniques (Taherdoost, 2016).

The use of non-probability sampling allows for the determination of the sample size when there is no sampling frame by selecting participants with the knowledge about the research issue and their willingness to partake in the research work where they cannot be randomly selected (Wilkins, 2011).

3.8 DATA COLLECTION

Data collection is the process of collecting vital information cautiously so that analysis of the information that provides answers that are credible to answer questions raised by research work, test hypotheses and evaluate outcomes (Showkat and Parveen, 2017). Data collection is the gathering of information from the objects of study systematically in their natural settings in order to answer research questions conclusively (Chaleunvong, 2009).

3.8.1 Types of Data

Kabir (2016) explained that there are two types of data, namely qualitative data and quantitative data. For this study, quantitative data was gathered through the use of a questionnaire. Quantitative data is a type of data that can be quantified and expressed numerically (Showkat and Parveen, 2017).

3.8.2 Data Collection Methods

There are several forms of collecting data in survey research. Some of these methods are interviews, questionnaires and observation (Hox and Boeije, 2005). This study made use of a questionnaire as the tool for data collection.

3.8.2.1 Questionnaire

A questionnaire is a document designed with a set of questions and used to solicit for information to answer a research problem (Acharya, 2010). Questionnaires are useful when conducting survey research in order to gather the views of the participants if the population is vast (Mathers et al., 2007). The questionnaire for this research was in four sections. The first section gathered background information about the respondent by asking questions on the following: Institution or Organisation, Position in the organisation, Qualification, years working experience and the number of years involved in projects that seek to conserve the environment or sustainable.

The second section asked respondents to rank several driving factors using the Likert scale on how critical they were to sustainable construction project financing. The third section was used to solicit the views of participants on how critical listed barriers were to sustainable construction project financing. The final section asked respondents their views on how vital the listed factors were to the financing of sustainable construction projects.

3.8 DATA ANALYSIS

Data analysis is a crucial aspect of every research. Sharma (2018) defined data analysis as the process of generating responses to questions through analysis and interpretation of data. Two sets of analyses were conducted namely descriptive analysis for the purpose mean value ranking, and inferential analysis (Independent T-test) was used to ascertain any difference in the mean values of the two groups of participants.

3.8.1 Descriptive Statistics

The most common descriptive statistics used for the ranking of factors is the mean and standard deviation (Kaushik and Mathur, 2014). Mean value analysis is one of the most widely used tools in research relating to sustainability in the construction industry and used to rank the factors in the order of importance (Chan *et al.*, 2010). In the situation where two factors have the same mean, the factor with the smallest standard deviation was used to rank the factor higher (Darko and Chan, 2018).

3.8.2 Inter Group Comparison Test

Since respondents are from two different professional backgrounds, it is vital to conduct a test to check if there was any noteworthy difference between their mean scores (Darko and Chan, 2018). The Independent T Test was used to compare the means of the two groups consisting of professionals in the construction industry and Finance sector. Table 3.2 below shows the levels of tests that were conducted and their purpose.

Table 3.2 Summary of Data Analysis Techniques

| Level | Analysis Technique | Purpose |
|-------|--|---|
| 1 | Descriptive Statistics (Mean, Standard Deviation and Standard Error) | To rank various drivers, barriers, and strategies based on their scores |
| 2 | Inferential Analysis (Independent T Test) | To ascertain the difference in mean values across different groups |

Source: Marshall et al., 2016

3.9 CHAPTER SUMMARY

This chapter discussed the philosophical standpoint of the research. A further review of the research approach, strategy and methods were done in this chapter. Review of the research population, sampling technique and form of data collection was also discussed in this chapter. Lastly, the type of analysis carried out was deliberated on in this chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The previous chapters addressed the introduction to the study, review of relevant literature and the methodology used to achieve the aim and objectives of the study. This chapter presents the results obtained from the questionnaire and analysis of the data. Discussion of the results obtained from the analysis was presented in this chapter as well.

4.2 DATA COLLECTION AND RESPONSE RATE

The data was collected using a questionnaire to gather information from professionals in the construction industry and finance sector with knowledge on sustainability, sustainable construction and sustainable construction financing.

Respondents were given time to answer various questions asked in the questionnaire. Through the initially identified respondents, other professionals with knowledge were identified and asked to participate. In all 30 participants from each group of professionals were willing to participate in the answering of the questionnaire. Even though the sample size was not significant, statistical analysis was could still be performed by the general rule of the central limit theorem holds when the sample size is 30 and above (Ott and Longnecker, 2010). There are other sustainability research works which are known to have used smaller sample sizes (eg., 21 in Hwang *et al.*, 2015 and 43 in Darko and Chan, 2018).

4.3 DEMOGRAPHIC INFORMATION OF RESPONDENTS

The questionnaire was used to gather data on the backgrounds of various participants on their working experience, position in their organisation, years of working experience and the number of years they have been exposed to projects which sort to conserve the environment or were

sustainable construction projects. The results obtained are presented in descriptive statistics in the form of frequencies and percentages.

Table 4.1 Demographic Information of Respondents with Background in Finance

| Demographic Information | | Frequency | Per cent |
|--------------------------------|-------------------------------------|------------------|-----------------|
| | Role | | |
| Economist | | 3 | 10 |
| Investment Analyst/Banker | | 14 | 46.7 |
| Compliance Manager | | 3 | 10 |
| Fund Manager | | 7 | 23.3 |
| Other | | 3 | 10 |
| | Education | | |
| Master's Degree | | 17 | 56.7 |
| Bachelor's Degree | | 11 | 36.7 |
| Higher National Diploma | | 1 | 3.3 |
| Others, eg. ACIEB | | 1 | 3.3 |
| | Working Experience | | |
| 16-20 years | | 2 | 6.7 |
| 11-15 years | | 13 | 43.3 |
| 5-10 years | | 11 | 36.7 |
| Less than five years | | 4 | 13.3 |
| | Experience in Sustainability | | |
| 1-5 years | | 17 | 56.7 |
| 5-10 years | | 6 | 20 |
| No Response | | 7 | 23.3 |

4.3.1 Demographic Information of Participants with Background in Finance

In all, 46.7 % of respondents with a background in Finance were either an Investment analyst, banker or advisor. Fund managers constituted 23.3 %, economists, compliance managers and other professionals with backgrounds in finance constituting 10% each. Out of a total of 100%, 56.7% had a master's degree, 36.7% had a bachelor's degree, and 3.3% had either a higher national diploma or another certificate. In terms of working experience, the highest rank was 43.3 % which represented 11- 15 years of working experience, those with 5-10 years had the second-highest ranking of 35.7 years, and 13.3% had less than five years' experience with 6.7%

having 16-20 years of working experience. In terms of years involved with projects that seek to reduce the use of resources and conserve the environment, 56.7% had been involved from 1-5 years while 5-10 years had a 20% representation with 23.3% not responding.

Table 4.2 Demographic Information of Respondents in the Construction Industry

| Demographic Information | | Frequency | Per cent |
|--------------------------------|-------------------------------------|------------------|-----------------|
| | Role | | |
| Architect | | 9 | 30 |
| Quantity Surveyor | | 7 | 23.3 |
| Engineer | | 7 | 23.3 |
| Project Manager | | 5 | 16.7 |
| Other, eg Procurement Officer | | 2 | 6.7 |
| | Education | | |
| Master's Degree | | 17 | 56.7 |
| Bachelor's Degree | | 9 | 30 |
| Higher National Diploma | | 4 | 13.3 |
| | Working Experience | | |
| 21-25 years | | 2 | 6.7 |
| 16-20 years | | 4 | 13.3 |
| 11-15 years | | 9 | 30 |
| 5-10 years | | 13 | 43.3 |
| Less than five years | | 2 | 6.7 |
| | Experience in Sustainability | | |
| 1-5 years | | 16 | 53.3 |
| 5-10 years | | 9 | 30 |
| No Response | | 5 | 16.7 |

4.3.2 Demographic Information of Participants in the Construction Industry

The respondents from the construction industry had 30% of them as architects, 23.3% as quantity surveyors, 23.3% of them were engineers, 16.7% of them were project managers, and 6.7% held other positions in their place of work. With their educational background, 56.7% held a master's degree, 30% had a bachelor's degree, and 13.3% have a higher national Diploma. With regards to their working experience, 6.7% had working experience of 21-25 years, 13.3% had 16-20 years' experience, 30% had 11-15 years of experience, 43.3% were in

the range of 5-10 years with 6.7 per cent having less than five years' experience. With experience in projects that seeks to reduce the use of resources and conserve the environment, 53.3% of the participants had experienced between 1-5 years, making them the majority. Those with 5-10 years' experience had a 30% representation, and 16.7% had no response.

4.4 DESCRIPTIVE ANALYSIS OF VARIOUS DRIVERS, BARRIERS AND PROMOTION STRATEGIES

The various drivers, barriers and promotion strategies have been ranked from the highest to the lowest among the groups. The mean value ranking shows how the different stakeholders view those variables and their roles in the financing of sustainable construction projects. In the cases where mean values were equal, the standard deviation values were used in the ranking of the variables. The four highest-ranked factors are considered either a critical driver or barrier and an important strategy for sustainable construction project financing.

4.4.1 Ranking of Drivers of Sustainable Construction Project Financing by Construction Professionals

For each of the drivers, the construction professionals rated how critical they are to sustainable construction project financing. Table 4.3 shows the mean scores (MS), standard deviations (SD) and standard errors (SE) of the eight drivers that were ranked.

From Table 4.3, four drivers were considered critical to the financing of sustainable construction projects by professionals in the construction industry. The four topmost drivers ranked critical by the construction industry professionals were 'reduced life cycle cost of projects' [mean score (MS) = 4.67, standard deviation (SD) = 0.547]; 'high return on investment' [mean score (MS) = 4.63, standard deviation (SD) = 0.490]; 'ethical investment' [mean score (MS) = 4.63, standard deviation (SD) = 0.556] and 'conservation of resources' [mean score (MS) = 4.60, standard deviation (SD) = 0.621]. The other drivers that were

considered significant but not critical were ‘emerging business opportunities’ [mean score (MS) = 4.53, standard deviation (SD) = 0.629], ‘mandatory legislation and standards’ [mean score (MS) = 3.87, standard deviation (SD) = 0.507], ‘corporate social responsibility’ [mean score (MS) = 3.57, standard deviation (SD) = 0.626] and ‘corporate image’ [mean score (MS) = 3.13, standard deviation (SD) = 0.629].

Table 4.3 Ranking of Drivers by Professionals in the Construction Industry

| <i>No.</i> | Drivers | Stakeholder | N | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|-------------------------------------|-----------------------|----------|------------------------|--------------------------------|----------------------------|-------------|
| <i>1</i> | Corporate Social Responsibility | Construction Industry | 30 | 3.57 | 0.626 | 0.114 | 7 |
| <i>2</i> | Ethical Investment | Construction Industry | 30 | 4.63 | 0.556 | 0.102 | 3 |
| <i>3</i> | Corporate Image | Construction Industry | 30 | 3.13 | 0.629 | 0.115 | 8 |
| <i>4</i> | Emerging Business Opportunity | Construction Industry | 30 | 4.53 | 0.629 | 0.115 | 5 |
| <i>5</i> | Reduced Life Cycle Cost | Construction Industry | 30 | 4.67 | 0.547 | 0.100 | 1 |
| <i>6</i> | Conservation of Resources | Construction Industry | 30 | 4.60 | 0.621 | 0.113 | 4 |
| <i>7</i> | High Return on Investment | Construction Industry | 30 | 4.63 | 0.490 | 0.089 | 2 |
| <i>8</i> | Mandatory Legislation and Standards | Construction Industry | 30 | 3.87 | 0.507 | 0.093 | 6 |

4.4.2 Ranking of Drivers of Sustainable Construction Project Financing by Finance

Professionals

For each of the same drivers ranked by the construction professionals, the financial professionals were required to rate how critical they are to sustainable construction project financing. Table 4.4 shows the mean score, standard deviation and standard errors of the eight drivers that were ranked.

From Table 4.4, four drivers were considered by the financial professionals to be critical to the financing of sustainable construction projects. The four topmost drivers ranked critical were ‘ethical investment’ [mean score (MS) = 4.77, standard deviation (SD) = 0.679]; ‘high return on investment’ [mean score (MS) = 4.73, standard deviation (SD) = 0.521]; ‘emerging business opportunity’ [mean score (MS) = 4.73, standard deviation (SD) = 0.583] and ‘conservation of resources’ [mean score (MS) = 4.53, standard deviation (SD) = 0.571]. The other drivers that were considered significant but not critical were ‘reduced life cycle cost’ [mean score (MS) = 4.33, standard deviation (SD) = 0.758], ‘corporate image’ [mean score (MS) = 4.07, standard deviation (SD) = 0.828], ‘mandatory legislation and standards’ [mean score (MS) = 3.70, standard deviation (SD) = 0.750] and ‘corporate social responsibility’ [mean score (MS) = 3.67, standard deviation (SD) = 0.661].

Table 4.4 Ranking of Drivers by Professionals in the Finance industry

| <i>No.</i> | Drivers | Stakeholder | <i>N</i> | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|-------------------------------------|--------------------|----------|----------------------------------|--|--------------------------------------|-------------|
| <i>1</i> | Corporate Social Responsibility | Finance | 30 | 3.67 | 0.661 | 0.121 | 8 |
| <i>2</i> | Ethical Investment | Finance | 30 | 4.77 | 0.679 | 0.124 | 1 |
| <i>3</i> | Corporate Image | Finance | 30 | 4.07 | 0.828 | 0.151 | 6 |
| <i>4</i> | Emerging Business Opportunity | Finance | 30 | 4.73 | 0.583 | 0.106 | 3 |
| <i>5</i> | Reduced Life Cycle Cost | Finance | 30 | 4.33 | 0.758 | 0.138 | 5 |
| <i>6</i> | Conservation of Resources | Finance | 30 | 4.53 | 0.571 | 0.104 | 4 |
| <i>7</i> | High Return on Investment | Finance | 30 | 4.73 | 0.521 | 0.095 | 2 |
| <i>8</i> | Mandatory Legislation and Standards | Finance | 30 | 3.70 | 0.750 | 0.137 | 7 |

4.4.3 Ranking of Barriers of Sustainable Construction Project Financing by Construction Professionals

For each of the barriers, construction professionals rated how critical they are to sustainable construction project financing. Table 4.5 shows the mean scores (MS), standard deviations (SD) and standard errors (SE) of the eight barriers that were ranked.

From Table 4.5, four barriers were considered critical to the financing of sustainable construction projects by professionals in the construction industry. The four topmost barriers ranked critical were ‘lack of knowledge among professionals’ [mean score (MS) = 4.80, standard deviation (SD) = 0.407]; ‘cost related barriers’ [mean score (MS) = 4.70, standard

deviation (SD) = 0.466]; ‘lack of policy direction and regulatory gaps’ [mean score (MS) = 4.50, standard deviation (SD) = 0.509] and ‘inadequate financing schemes’ [mean score (MS) = 4.43, standard deviation (SD) = 0.504]. Other barriers which were considered significant but not critical were ‘barrier of split incentives’ (MS = 4.40, SD = 0.621), ‘insufficient government’ (MS = 4.37, SD = 0.490), ‘lack of credible database’ (MS = 4.37, SD = 0.718) and ‘risk related barriers’ (MS = 3.00, SD = 0.455).

Table 4.5 Ranking of Barriers by Professionals in the Construction Industry

| <i>No.</i> | Barriers | Stakeholder | N | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|--|-----------------------|----------|------------------------|--------------------------------|----------------------------|-------------|
| <i>1</i> | Lack of Credible Database | Construction Industry | 30 | 4.37 | 0.718 | 0.131 | 7 |
| <i>2</i> | Cost Related Barriers eg. High upfront cost | Construction Industry | 30 | 4.70 | 0.466 | 0.085 | 2 |
| <i>3</i> | Risk Related Barriers | Construction Industry | 30 | 3.00 | 0.455 | 0.083 | 8 |
| <i>4</i> | Barrier of Split Incentives | Construction Industry | 30 | 4.40 | 0.621 | 0.113 | 5 |
| <i>5</i> | Lack of Policy direction and Regulatory gaps | Construction Industry | 30 | 4.50 | 0.509 | 0.093 | 3 |
| <i>6</i> | Lack of Knowledge among Professionals | Construction Industry | 30 | 4.80 | 0.407 | 0.074 | 1 |
| <i>7</i> | Insufficient Government Support | Construction Industry | 30 | 4.37 | 0.490 | 0.089 | 6 |
| <i>8</i> | Inadequate Financing Schemes | Construction Industry | 30 | 4.43 | 0.504 | 0.078 | 4 |

4.4.4 Ranking of Barriers of Sustainable Construction Project Financing by Finance

Professionals

For each of the barriers that were ranked by the construction professionals, the financial professionals were required to rank how critical they are to sustainable construction project financing. Table 4.6 shows the mean scores (MS), standard deviations (SD) and standard errors (SE) of the eight barriers that were ranked. From Table 4.6, four barriers were also considered by financial professionals to be critical to the financing of sustainable construction projects. The four topmost barriers ranked critical were ‘cost related barriers’ [mean score (MS) = 4.67, standard deviation (SD) = 0.606]; ‘lack of knowledge among professionals’ [mean score (MS) = 4.53, standard deviation (SD) = 0.819]; ‘lack of credible database’ [mean score (MS) = 4.37, standard deviation (SD) = 0.556] and ‘insufficient government support’ [mean score (MS) = 4.37, standard deviation (SD) = 0.765]. Other barriers which were considered significant but not critical were ‘lack of policy direction and regulatory gaps’ (MS = 4.33, SD = 0.606), ‘inadequate financing approaches’ (MS = 4.27, SD = 0.691), ‘barrier of split incentives’ (MS = 4.23, SD = 0.774) and ‘risk-related barriers’ (MS = 3.87, SD = 0.507).

Table 4.6 Ranking of Barriers by Professionals in the Finance Industry

| <i>No.</i> | Barriers | Stakeholder | <i>N</i> | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|--|--------------------|----------|------------------------|--------------------------------|----------------------------|-------------|
| <i>1</i> | Lack of Credible Database | Finance | 30 | 4.37 | 0.556 | 0.102 | 3 |
| <i>2</i> | Cost Related Barriers eg. High upfront cost | Finance | 30 | 4.67 | 0.606 | 0.111 | 1 |
| <i>3</i> | Risk Related Barriers | Finance | 30 | 3.87 | 0.507 | 0.093 | 8 |
| <i>4</i> | Barrier of Split Incentives | Finance | 30 | 4.23 | 0.774 | 0.141 | 7 |
| <i>5</i> | Lack of Policy direction and Regulatory gaps | Finance | 30 | 4.33 | 0.606 | 0.111 | 5 |
| <i>6</i> | Lack of Knowledge among Professionals | Finance | 30 | 4.53 | 0.819 | 0.150 | 2 |
| <i>7</i> | Insufficient Government Support | Finance | 30 | 4.37 | 0.765 | 0.140 | 4 |
| <i>8</i> | Inadequate Financing Schemes | Finance | 30 | 4.27 | 0.691 | 0.126 | 6 |

4.4.5 Ranking of Strategies to Promote Sustainable Construction Project Financing by Construction Professionals

For each of the strategies identified in the literature, the construction professionals were asked to score how important they are to promoting sustainable construction project financing. Table 4.7 shows the mean scores (MS), standard deviations (SD) and standard errors (SE) of the eight strategies that were ranked. Out of the eight strategies four were identified by the respondents to be significant in promoting the financing of sustainable construction projects. The four topmost strategies ranked important were ‘training and education’ [mean score (MS) = 4.80, standard deviation (SD) = 0.407]; ‘incentives’ [mean score (MS) = 4.57, standard deviation

(SD) = 0.626]; ‘government support’ [mean score (MS) = 4.50, standard deviation (SD) = 0.72] and ‘Legal framework for Sustainable Construction’ [mean score (MS) = 4.43, standard deviation (SD) = 0.728]. Other strategies which were also considered significant were ‘credible information database’ (MS = 4.33, SD = 0.711), ‘research on sustainable construction and its financing’ (MS = 4.10, SD = 0.403), ‘availability of market for products’ (MS = 3.43, SD = 0.504) and ‘positioning financial industry to deal with sustainable construction’ (MS = 3.13, SD = 0.681).

Table 4.7 Ranking of Promotion Strategies by Professionals in the Construction Industry

| <i>No.</i> | Promotion Strategies | Stakeholder | N | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|---|-----------------------|----------|----------------------------|------------------------------------|--------------------------------|-------------|
| 1 | Credible Information Database | Construction Industry | 30 | 4.33 | 0.711 | 0.130 | 5 |
| 2 | Government Support | Construction Industry | 30 | 4.50 | 0.572 | 0.104 | 3 |
| 3 | Position Financial Industry to deal with Sustainable Construction | Construction Industry | 30 | 3.13 | 0.681 | 0.124 | 8 |
| 4 | Training and Education | Construction Industry | 30 | 4.80 | 0.407 | 0.074 | 1 |
| 5 | Legal Framework for Sustainable Construction | Construction Industry | 30 | 4.43 | 0.728 | 0.130 | 4 |
| 6 | Provision of Incentives eg. Tax grants, low interest loans | Construction Industry | 30 | 4.57 | 0.626 | 0.114 | 2 |
| 7 | Research on sustainable construction and its financing | Construction Industry | 30 | 4.10 | 0.403 | 0.074 | 6 |
| 8 | Availability of Market for Products | Construction Industry | 30 | 3.43 | 0.504 | 0.092 | 7 |

4.4.6 Ranking of Strategies of Sustainable Construction Project Financing by Finance

Professionals

For each of the strategies scored by the construction professionals, the financial professionals were also required to indicate how important they are to sustainable construction project financing. Table 4.7 shows the mean scores (MS), standard deviations (SD) and standard errors (SE) of the eight strategies that were ranked. From Table 4.7, four strategies were considered by the financial professionals to be significant to the financing of sustainable construction projects. The four topmost strategies ranked important were ‘government support’ [mean score

(MS) = 4.70, standard deviation (SD) = 0.596]; ‘training and education’ [mean score (MS) = 4.60, standard deviation (SD) = 0.498]; ‘incentives’ [mean score (MS) = 4.53, standard deviation (SD) = 0.730] and ‘positioning of financial industry to deal with sustainable construction’ [mean score (MS) = 4.27, standard deviation (SD) = 0.907]. Other strategies which were also considered significant were ‘credible information database’ (MS = 4.20, SD = 0.610), ‘Legal framework for Sustainable Constructions’ (MS = 4.20, SD = 0.714), ‘research on sustainable construction and it’s financing’ (MS = 4.10, SD = 0.712) and ‘availability of market for products’ (MS = 3.10, SD = 0.845).

Table 4.7 Ranking of Promotion Strategies by Professionals in the Finance Industry

| <i>No.</i> | Promotion Strategies | Stakeholder | <i>N</i> | Mean Score (MS) | Standard Deviation (SD) | Standard Error (SE) | Rank |
|------------|---|--------------------|----------|----------------------------------|--|--------------------------------------|-------------|
| 1 | Credible Information Database | Finance | 30 | 4.20 | 0.610 | 0.111 | 5 |
| 2 | Government Support | Finance | 30 | 4.70 | 0.596 | 0.109 | 1 |
| 3 | Position Financial Industry to deal with Sustainable Construction | Finance | 30 | 4.27 | 0.907 | 0.166 | 4 |
| 4 | Training and Education | Finance | 30 | 4.60 | 0.498 | 0.091 | 2 |
| 5 | Legal framework for Sustainable Construction | Finance | 30 | 4.20 | 0.714 | 0.130 | 6 |
| 6 | Provision of incentives eg. Tax grants, low interest loans | Finance | 30 | 4.53 | 0.730 | 0.133 | 3 |
| 7 | Research on Sustainable construction and its Financing | Finance | 30 | 4.10 | 0.712 | 0.130 | 7 |
| 8 | Availability of Market for Products | Finance | 30 | 3.10 | 0.845 | 0.154 | 8 |

4.5 PRESENTATION OF INFERENTIAL ANALYSIS RESULTS (INDEPENDENT T TEST)

The means of the various drivers, barriers and important strategies among the groups were compared to check if there were any significant differences. In this case, the null hypothesis (H_0) is that there is no significant difference in the means of the two groups and the researcher's hypothesis (H_1) is that there is a significant difference in the means of the two groups. For the null hypothesis to be rejected $p < 0.05$ at a 95% confidence level while for the new hypothesis (H_1) to hold, $p > 0.05$ at a 95% confidence level. The independent T-test was used to compare

the means of both professionals with a background in finance and the construction industry. In the case where the significant value was greater than 0.05 in the Levene's Test for Equality of Variances, values for equal variance assumed was reported, and when a significant value was less the 0.05, values for equal variances not assumed was reported. The results are represented in the following format (Finance Group) and (Construction Industry Group) Conditions; t (df) = t stat, p = value.

4.5.1 Presentation of Independent T test Results for Drivers

Out of the eight drivers identified as being motivators for sustainable construction project financing, only one recorded a significant difference in the mean values. The driver with a significant difference was corporate image with values of (MS = 4.07, SD = 0.828) for the participants with finance background and (MS = 3.13, SD = 0.629) for the construction industry participants at conditions; t (58) = 4.918, p = 0.000. The drivers with no significant difference were Corporate social responsibility [(MS = 3.67, SD = 0.661) and (MS = 3.57, SD = 0.626) conditions; t (58) = 0.602, p = 0.550]; Ethical Investment [(MS = 4.77, SD = 0.679) and (MS = 4.63, SD = 0.556) conditions; t (58) = 0.832, p = 0.409]; Emerging business opportunity [(MS = 4.73, SD = 0.583) and (MS = 4.53, SD = 0.629) conditions; t (58) = 1.277, p = 0.207]; Reduced life cycle cost [(MS = 4.33, SD = 0.758) and (MS = 4.67, SD = 0.547) conditions; t (58) = -1.593, p = 0.560]; Conservation of Resources [(MS = 4.53, SD = 0.571) and (MS = 4.60, SD = 0.621) conditions t (58) = -0.433, p = 0.667]; High return on investment [(MS = 4.73, SD = 0.521) and (MS = 4.63, SD = 0.490) conditions t (58) = 0.766, p = 0.447] and Regulations, Standards and policies [(MS = 3.70, SD = 0.750) and (MS = 3.87, SD = 0.507) conditions t (50.960) = -1.008, p = 0.318].

Table 4.8 Independent T Test for Drivers of Sustainable

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|---------------------------|---|-------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Standard Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Corporate Social Responsibility | Equal Variances assumed | .000 | .876 | .602 | 58 | .550 | .102 | .166 | -.233 | .433 |
| | Equal Variances not assumed | | | .602 | 57.831 | .550 | .102 | .166 | -.233 | .433 |
| Ethical Investment | Equal Variance Assumed | .605 | .440 | .832 | 58 | .409 | .133 | .160 | -.187 | .454 |
| | Equal Variances not assumed | | | .832 | 55.833 | .409 | .133 | .160 | -.188 | .454 |
| Corporate Image | Equal Variances Assumed | 1.673 | .201 | 4.918 | 58 | .000 | .933 | .190 | .533 | 1.313 |
| | Equal Variances not assumed | | | 4.918 | 54.11 | .000 | .933 | .190 | .533 | 1.314 |
| Emerging Business Opportunity | Equal Variances Assumed | 2.393 | .127 | 1.277 | 58 | .207 | .200 | .157 | .113 | .513 |
| | Equal Variances not assumed | | | 1.277 | 57.676 | .207 | .200 | .157 | .113 | .513 |
| Reduced Life Cycle Cost | Equal Variances Assumed | 2.930 | .092 | -1.953 | 58 | .056 | -.333 | .171 | -.675 | .008 |
| | Equal Variances not assumed | | | -1.953 | 52.741 | .056 | -.333 | .171 | -.675 | .009 |
| Conservation of Resources | Equal Variances Assumed | .005 | .946 | -.433 | 58 | .667 | -.067 | .154 | -.375 | .242 |
| | Equal Variances not assumed | | | -.433 | 57.595 | .667 | -.067 | .154 | -.375 | .242 |
| High Return On Investment | Equal Variances Assumed | .802 | .374 | .766 | 58 | .447 | -.100 | .131 | -.161 | .361 |
| | Equal Variances not assumed | | | .766 | 57.787 | .447 | -.100 | .131 | -.161 | .361 |
| Regulations, Standards and Legislation | Equal Variances Assumed | 8.139 | .006 | -1.008 | 58 | .317 | -.167 | .165 | -.498 | .164 |
| | Equal Variances not assumed | | | -1.008 | 50.960 | .318 | -.167 | .165 | -.498 | .165 |

4.5.2 Presentation of Independent T test Results for Critical Barriers

Among the eight barriers which were identified as impediments to sustainable construction project financing, only one of them had significant difference in its mean values between the two groups of professionals in finance and construction industry. The specific barrier that had a significant difference in its mean values was 'Risk related barriers' with a score of (MS = 3.87, SD = 0.507) for the finance group and (MS = 3.00, SD = 0.455) for the construction industry participants at conditions; $t(58) = 6.966, p = 0.000$. The null hypothesis was rejected in this case. The other drivers which include , 'Lack of credible information database' [(MS = 4.37, SD = 0.556) and (MS = 4.37, SD = 0.718) conditions; $t(58) = 0.00, p=1.00$]; 'Cost related barrier' [(MS =4.67, SD=0.606) and (MS =4.70, SD = 0.446) conditions; $t(58) = -0.239, p = 0.812$]; 'Barrier of split incentives' [(MS = 4.23, SD =0.774) and (MS = 4.40, SD = 0.621) conditions; $t(58) = -0.920, p= 0.362$]; 'lack of policy direction and regulatory gaps' [(MS = 4.33, SD = 0.606) and (MS = 4.50, SD = 0.509) conditions; $t(58) = -1.153, p = 0.254$]; 'Lack of knowledge among professionals' [(MS = 4.53, SD = 0.819) and (MS = 4.80, SD = 0.407) conditions $t(42.482) = -1.597, p = 0.116$], 'Insufficient government support' [(MS = 4.37, SD = 0.765) and (MS = 4.37, SD = 0.490) conditions $t(49.379) = 0.000, p = 1.000$] and 'Inadequate financing schemes' [(MS = 4.27, SD = 0.691) and (MS = 4.43, SD = 0.504) conditions $t(58) = -1.067, p = 0.290$] had no significant difference in their mean values, hence, the null hypothesis was accepted for these barriers.

Table 4.9 Independent T Test for Barriers of Sustainable Construction Project Financing

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|---------------------------|---|-------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Standard Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Lack of Credible Information Database | Equal Variances assumed | 3.325 | .073 | .000 | 58 | 1.000 | .000 | .166 | -.332 | .332 |
| | Equal Variances not assumed | | | .000 | 54.570 | 1.000 | .000 | .166 | -.332 | .332 |
| Cost Related Barrier eg. High upfront cost, short payback period | Equal Variance Assumed | .917 | .342 | -.239 | 58 | .812 | -.032 | .140 | -.313 | .246 |
| | Equal Variances not assumed | | | -.239 | 54.397 | .812 | -.032 | .140 | -.313 | .247 |
| Risk Related Barriers eg. Litigation, insurance | Equal Variances Assumed | .2161 | .147 | 6.966 | 58 | .000 | .867 | .124 | .618 | 1.116 |
| | Equal Variances not assumed | | | 6.966 | 57.320 | .000 | .867 | .124 | .618 | 1.116 |
| Barrier of Split Incentives | Equal Variances Assumed | .314 | .577 | -.920 | 58 | .362 | -.167 | .181 | -.529 | .196 |
| | Equal Variances not assumed | | | -.920 | 55.418 | .362 | -.167 | .181 | -.529 | .196 |
| Lack of policy direction and regulatory gaps | Equal Variances Assumed | .453 | .504 | -1.153 | 58 | .253 | -.167 | .145 | -.456 | .125 |
| | Equal Variances not assumed | | | -1.153 | 56.290 | .254 | -.167 | .145 | -.456 | .125 |
| Lack of Knowledge among professionals | Equal Variances Assumed | 11.523 | .001 | -1.597 | 58 | .116 | -.267 | .167 | -.601 | .068 |
| | Equal Variances not assumed | | | -1.597 | 42.482 | .118 | -.267 | .167 | -.604 | .070 |
| Insufficient Government support | Equal Variances Assumed | 10.283 | .002 | .000 | 58 | 1.000 | .000 | .166 | -.332 | .332 |
| | Equal Variances not assumed | | | .000 | 49.379 | 1.000 | .000 | .166 | -.333 | .333 |
| Inadequate financing schemes | Equal Variances Assumed | 2.163 | .147 | -1.067 | 58 | .290 | -.167 | .156 | -.479 | .146 |
| | Equal Variances not assumed | | | -1.067 | 53.030 | .291 | -.167 | .156 | -.480 | .147 |

4.5.3 Presentation of Independent T test Results for Important Promotion Strategies

One promotion strategy recorded a significant difference in the mean values of the two groups involved in this study. The strategy with difference in mean values was ‘Positioning the finance industry to handle sustainable construction issues’ [(MS = 4.27, SD = 0.907] for the finance group and the construction industry group (MS = 3.23, SD = 0.681) conditions $t(53.823) = 5.471, p = 0.000$. The other strategies which include ‘Credible information database’ [(MS = 4.20, SD = 0.610) and (MS = 4.33, SD = 0.711) with conditions $t(58) = -0.779, p = 0.439$]; ‘Government support’ [(MS = 4.70, SD = 0.596) and (MS = 4.50, SD = 0.572) with conditions of $t(58) = 1.326, p = 0.190$]; ‘Training and education’ [(MS = 4.60, SD = 0.498) and (MS = 4.80, SD = 0.407) with conditions $t(55.769) = -1.703, p = 0.094$]; ‘Legal framework for Sustainable Construction’ [(MS = 4.20, SD = 0.714) and (MS = 4.43, SD = 0.728) with conditions; $t(58) = -1.253, p = 0.215$]; ‘Incentives’ [(MS = 4.53, SD = 0.730) and (MS = 4.57, SD = 0.626) with conditions $t(58) = -0.190, p = 0.850$]; ‘Research on sustainable construction and it’s financing’ [(MS = 4.10, SD = 0.712) and (MS = 4.10, SD = 0.403) at conditions $t(45.824) = 0.000, p = 1.000$] and ‘Market for sustainable product’ [(MS = 3.10, SD = 0.845) and (MS = 3.43, SD = 0.504) Conditions; $t(58) = -1.856, p = 0.069$] recorded no significant difference in their mean values, hence, the null hypothesis was accepted for these strategies.

Table 4.10 Independent T Test for Promotion Strategies of Sustainable Construction Project Financing

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|---------------------------|---|-------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Standard Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Credible Information Database | Equal Variances assumed | 2.536 | .117 | -7.99 | 58 | .439 | -.133 | .171 | -.476 | .209 |
| | Equal Variances not assumed | | | -7.99 | 56.693 | .439 | -.133 | .171 | -.476 | .209 |
| Government Support | Equal Variance Assumed | .951 | .333 | 1.326 | 58 | .190 | .200 | .151 | -.102 | .502 |
| | Equal Variances not assumed | | | 1.326 | 57.905 | .190 | .200 | .151 | -.102 | .502 |
| Positioning Finance industry to handle sustainable construction issues | Equal Variances Assumed | 4.114 | .047 | 5.471 | 58 | .000 | 1.133 | .207 | .719 | 1.548 |
| | Equal Variances not assumed | | | 5.471 | 53.823 | .000 | 1.133 | .207 | .718 | 1.549 |
| Training and Education | Equal Variances Assumed | 11.048 | .002 | -1.703 | 58 | .094 | -.200 | .117 | -.435 | .035 |
| | Equal Variances not assumed | | | -1.703 | 55.769 | .094 | -.200 | .117 | -.435 | .035 |
| Legal framework for Sustainable Construction | Equal Variances Assumed | .360 | .551 | -1.253 | 58 | .215 | -.233 | .186 | -.606 | .139 |
| | Equal Variances not assumed | | | -1.253 | 57.980 | .215 | -.233 | .186 | -.606 | .139 |
| Incentives eg. Tax grants, low interest rate loans | Equal Variances Assumed | .757 | .388 | -.190 | 58 | .850 | -.033 | .176 | -.385 | .318 |
| | Equal Variances not assumed | | | -.190 | 56.677 | .850 | -.033 | .176 | -.385 | .318 |
| Research on sustainable construction and its financing | Equal Variances Assumed | 8.774 | .004 | .000 | 58 | 1.000 | .000 | .149 | -.299 | .299 |
| | Equal Variances not assumed | | | .000 | 45.824 | 1.000 | .000 | .149 | -.301 | .301 |
| Market for sustainable product | Equal Variances Assumed | 1.361 | .248 | -1.856 | 58 | .069 | -.333 | .180 | -.693 | .026 |
| | Equal Variances not assumed | | | -1.856 | 47.321 | .070 | -.333 | .180 | -.695 | .028 |

4.6 DISCUSSION OF RESULTS FOR CRITICAL DRIVERS

This section discusses the results presented from the data collected on critical drivers of sustainable construction project financing. Drivers are motivating factors that direct all activities to the achievement of sustainability goals; in this case, sustainable construction project financing (Shelbourn *et al.*, 2006). The critical drivers identified by the respondents are discussed to include the following:

4.6.1 Ethical Investment

Ethical investment is a new trend in the finance sector where certain investments are geared towards only projects that are considered only on ethical grounds which includes sustainable construction projects that are geared towards providing the infrastructure that seeks to conserve the resources as well as providing a convenient space that improves the wellbeing of its occupants. Both the construction and finance professionals affirmed the point made in the literature that ethical investment is a critical driver that drives investments since there are funds available to be accessed for such projects solely. This enforces the point of Youssef and Whyte (2016) who indicated that ethical investment is one of the drivers of sustainable construction project going forward. Funds can be easily accessed for sustainable construction projects because more organisations are turning their investments to projects that are meant to save the environment and conserve its resources (Rimmer, 2016).

4.6.2 Emerging Business Opportunity

Sustainable Construction is now gaining the needed attention; the finance professionals viewed financing of such projects as a new form of business that can be used to drive up investments in sustainable construction projects because of the different opportunities it comes with such as manufacturing of new materials that meet sustainable standards. Considering the benefits that can be obtained from building sustainably, participants felt it was too good an opportunity for anyone to pass on. Investors such as the International Finance Corporation has taken the

lead in this business venture by investing in the manufacturing sector for the production of quality and affordable materials for sustainable construction (IFC, 2010). Yudelson, (2012) made the argument that several investors were taking advantage of the incentives such as tax grants to diversify their investment into investment portfolio's that are concerned with sustainable construction in order to maximise their profits. Even though the construction professionals thought otherwise, the point of the finance professionals has been reinforced by literature making it a critical driver to drive investment in sustainable construction project financing.

4.6.3 Reduced Life Cycle Cost

This driver was considered critical because the economic benefits gained from sustainable buildings outweigh that of conventional buildings (Dwaikat and Ali, 2018b). Considering the savings made during the maintenance period of a project's life span, the driver was considered a critical driver by the construction professionals who felt the savings made can make up for the initial cost of putting up such projects (Fletcher, 2009). A study in Sri Lanka on life cycle cost of sustainable buildings and conventional buildings showed the operational, maintenance and end of life cost of sustainable buildings was much lower compared to conventional buildings (Weerasinghe et al., 2017). This also showed that apart from environmental and social benefits derived from sustainable buildings another benefit that was to be gained was economically through savings made over the life span of such buildings making it a critical driver for developers and investors of such projects.

4.6.4 Conservation of Resources

One of the cardinal goals of sustainability is the prudent use of resources in a way that the future generation will also be able to utilise the same resources. Sustainable construction is hinged on this cardinal goal of sustainability, and as such, both professionals agreed it was a critical driver in the financing of such projects. Neyestani (2017) noted that the benefits accrued

from building sustainably outweighed the cost of materials and technology used to make the projects sustainable and limit the over-dependence on natural resources. In order to make buildings consume less energy, much technology is needed so that there is a reduction in the use of energy production that affects the environment. Conserving resources through the energy, land, material and water conservation was vital in protecting our natural resources (Akadiri et al., 2012).

4.6.5 High Return on Investment

Research has found that commercial properties with eco labels, for instance, sell faster and command higher interest rates compared to conventional properties because of the different conditions available to the two different buildings (Choi, 2009). Azizi *et al.* (2011) noted the advent of developers renting and selling eco-labelled facilities more than the conventional facilities. Investors are all about making profits, and if they can make a higher return on their investments and be able to save the environment, it is an opportunity which is too good to pass. This point was enforced by Low et al. (2014) study that showed that commercial facilities attracted 10% more in interest compared to conventional buildings. Sustainable facilities, for instance, command high occupancy rates which translate in higher rent paid by the users of the facilities making it more profitable to invest in such projects (Construction, 2008). This finding agrees with the points raised in literature that the return on investments made in investing in sustainable construction projects motivates investors to invest in more sustainable construction projects.

4.7 DISCUSSION OF RESULTS ON CRITICAL BARRIERS OF SUSTAINABLE CONSTRUCTION PROJECT FINANCING

Although there are benefits associated with the financing of sustainable construction projects, there are also barriers that hinder the involvement of the financial sector from sustainable

construction projects (Shan et al., 2017). This section discusses the factors considered by the respondents to be critical barriers to sustainable construction project financing.

4.7.1 Lack of Credible Information Database

Investment decisions are based on consistent, accurate analysis and interpretation of data. Lack of such vital data on sustainable construction projects makes it difficult for the financial sector to get involved in the financing of such projects. As such this barrier was ranked as one of the critical barriers that impede the implementation of sustainable construction project financing because investors lack the vital benchmark data that can be used to assess new projects. The finance professionals agreed with the point made in the literature that lack of credible information database on which investment decisions can be based is detrimental to the financing of such projects. This point is supported in literature that due to lack of credible data on the investment made in previous sustainable construction projects, it is difficult for most investors to invest in such projects because their decisions are based on numbers and data generated available (Clark et al., 2018). Sethi *et al.* (2017) noted that in the absence of crucial data and information it was difficult to make financial appraisal of sustainable construction project.

4.7.2 Cost Related Barriers

Cost related barriers are one of the most critical barriers impeding financing of sustainable construction projects (Abdin and Azizi, 2016). Some of the examples of cost barriers are a high upfront cost for sustainable construction projects due to the nature of materials and technology incorporated (Yudelson, 2010). Savings that are made from sustainable construction projects are savings made during the operational stage which leads to a more extended period to pay back investments but is not afforded the chance due to the shorter payback period for investments available for the financing of such projects. These factors make it difficult for any

investor to leave investment tied to such projects considering other financial risks associated with construction projects. This barrier was ranked as one of the critical drivers by the two professional groups. A report by Marsh (2009) highlighted the fact that financial risks are the number one risk associated with sustainable construction projects due to the factors such as high upfront cost, short payback period, the high-interest rate which affects sustainable construction projects. Investors are not willing to invest in sustainable construction projects due to the fear of losing investment due to new expensive technology and materials which have the tendency of failing (Bradshaw *et al.*, 2005). The high cost of certification has also been noted as one of the factors that increase the cost of constructing a sustainable building. For instance, the cost of EDGE certification in Ghana costs between \$ 8,000.00 and \$ 9,000.00 which deters most investors. All this information from literature enforces the point that cost is one of the critical barriers to financing of sustainable construction project.

4.7.3 Lack of Policy Direction and Regulatory Gaps

Investors need confidence in the market that the investments are not going down the drain whenever they decide to invest in any sector of society. One of the factors that can give them confidence is when there is a Legal framework for Sustainable Construction in place to safeguard their investment. Since this is one of the critical barriers, efforts must be put in place to ensure that this does not affect the financing of sustainable construction projects. This barrier has been caused by lack of consistent policy direction, appropriate regulatory framework and lack of support from the government concerning the financing of sustainable construction projects in the past (GreenClimateFund, 2017). Soundarrajan and Vivek (2016) argued that the lack of policies guiding financing of sustainable construction projects and regulatory gaps has made it difficult for more investment to be directed into sustainable construction projects. If efforts are not made to check this, financing of such projects will become difficult (Nakhooda,

2013). These points go to reinforce the point by construction professionals that this barrier is critical in impeding the financing of sustainable projects.

4.7.4 Lack of Knowledge among Professionals

Both groups acknowledged the fact that their deficit in knowledge regarding sustainable construction issue impedes the aim of successfully implementing financing of such projects. Volz (2018) pointed out the fact that many professionals in the finance sector have limited knowledge on sustainability issues, and the same can be said for the construction industry sector. In order to ensure the success of the implementation of sustainable construction project financing, it is crucial that professionals in these fields are well informed to aid their decision making with regards to the financing of sustainable construction issues. This point was reiterated by (Malina, 2013; Ametepey et al., 2015) who argued the importance of stakeholders having sufficient knowledge to help them achieve the aim of sustainable construction.

4.7.5 Insufficient Government Support

Without the support of the government, it is difficult to attract and sustain interest in financing of sustainable construction projects. Government has a huge role to play in ensuring that conditions are right in order to attract investors for the financing of such projects. Deng *et al.* (2016) noted the unattractiveness of financing sustainable construction projects due to the perceived high cost associated with it making investors lose interest. Without the support of government, it becomes difficult to attract all these investors in financing the projects (Alsanad, 2015). These points made in literature supports the point by the finance professionals who suggest without government support, it becomes difficult for them to invest in sustainable construction projects.

4.7.6 Inadequate Financing Schemes for Sustainable Construction Projects

Construction is a capital-intensive venture that requires funding at all times to ensure meeting the aim of the construction project. Most of the criteria used in assessing construction projects are geared towards conventional construction projects (Choi, 2009). This makes it difficult to access funds readily to finance sustainable construction projects. Due to this phenomenon, it is difficult to raise funds to cover the enormous upfront costs associated with sustainable construction projects. One critical barrier raised by construction professionals is the lack of financing schemes. Lack of financing schemes to fund such projects has challenged the construction industry from expanding the number of sustainable construction projects (Qian and Chan, 2010). These points to the fact that the findings agree with literature that lack of financing schemes is a critical barrier.

4.8 DISCUSSION OF RESULTS FOR STRATEGIES FOR PROMOTING SUSTAINABLE CONSTRUCTION PROJECT FINANCING

Strategies are a set of guidelines or policies designed to deal with a particular issue (Ferreira et al., 2014). After the identification of the critical drivers and barriers, it is essential that strategies are put in place to ensure that financing of sustainable construction project financing is promoted. This section discusses the critical strategies that are important for the promotion of sustainable construction project financing.

4.8.1 Government Support

Government's support is one of the most important promotion strategies ranked by the groups because, without it, the whole process of implementing sustainable construction project financing goal is defeated. Government support will ensure that investors have the needed confidence to invest in this area of the construction sector. Government has a huge role to play

in achieving this aim, providing favourable market conditions, Legal framework for Sustainable Construction to guide the construction and finance industry are some of the supports needed from the government to ensure that investors and developers are motivated enough to aid in the implementation of sustainable construction project financing (Shan et al., 2017). Both groups of professionals alluded to the fact that government support was one of the important strategies needed to drive up investments in sustainable construction. Soundarrajan and Vivek (2016) indicated that without the support of the governments, it was difficult to attract investors to invest in the construction sector. The construction industry is crippled with its challenges already, therefore in transitioning to sustainable construction, and much support would be welcomed.

4.8.2 Positioning of Financial Industry to Deal with Sustainable Construction Project

Financing

The finance group echoed the point that, positioning their industry to handle issues related to sustainability and sustainable construction issues, was one of the important strategies for them to be able to promote the financing of sustainable construction projects. The financial sector has a huge role to play in the financing of sustainable construction projects, and this can only be executed when they are well-positioned to handle issues connected to the financing of sustainable construction projects (Bhardwaj, 2013). With the appropriate market conditions and friendly credit policies, financial institutions can finance sustainable construction projects knowing all risks associated with the project can be dealt with appropriately thereby increasing the level of investment in such projects (Zhang, 2015).

4.8.3 Training and Education

Educating the public on the benefits of a sustainable building goes to help in the long run to ensure there is demand for such projects. Education can be achieved through awareness programs to ensure the public have available to them the information they need to make their decisions. Professionals involved in such projects also need to be trained on current trends and practises to ensure they will be able to implement them. Several studies have supported the idea of training financial professionals in order to be able to shift towards the idea of financing sustainable construction projects (Potbhare et al., 2009). Construction industry professionals must be trained for them to deal with new materials, technology and gain adequate knowledge that aids the implementation of sustainable construction practices. Without this vital training and education, it becomes difficult to implement sustainable practices which are needed to attract investment in sustainable construction project financing (Darko *et al.*, 2017).

4.8.4 Legal framework for Sustainable Construction

The formulation and application of policies and regulations to guide the implementation of sustainable construction project financing is essential as it will make stakeholders make voluntary efforts to make investments in sustainable construction projects. The construction professionals considered Legal framework for Sustainable Construction as one of the strategies needed to promote the financing of sustainable construction projects. Policies that undermine the growth of sustainable development must be identified and removed (Merk *et al.*, 2012). Legislation that guides the construction industry must be fine-tuned to cater for sustainable construction projects. The US government strategy of increasing investment and participation in sustainable development was to formulate policies that reward participation in sustainable construction projects (Gou et al., 2013).

4.8.5 Incentives

Financial incentives and market related incentives are critical to the implementation of sustainable construction project financing. Examples of the incentives like tax grants, low interest rate loans, low property rate and many more are important strategies that must be considered if there is the desire to promote sustainable construction project financing (Gou et al., 2013). The long term benefits that will be enjoyed with these incentives in place will drive the interest in more stakeholders to get involved with the financing of sustainable construction projects. Azeem *et al.* (2017) argued that adopters and investors of sustainable construction projects need to be rewarded with financial and other market related incentives for their efforts in achieving the goals of sustainable development. Both groups of participants agree with the point highlighted in the literature that incentives were one of the important strategies needed for the promotion of sustainable construction project financing.

4.9 CHAPTER SUMMARY

This chapter presented the results of quantitative analysis. Results were presented on demographic information of participants, drivers of sustainable construction project financing, barriers to sustainable construction project financing. Results on important strategies needed for the promotion of sustainable construction project financing was also presented in this chapter. Finally, the discussion of the different results obtained from the analysis was presented.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The study sought to propose strategies to enable the financing of sustainable construction projects. Three objectives guided by research questions were set to accomplish the stated aim. In this chapter, the research questions, as well as the objectives, are revisited to account for the various processes that were utilised in achieving the aim of the study. Based on the findings of the study, this chapter presents recommendations as well as the limitations of this study. Finally, further research areas that relate to this study have been suggested.

5.2 RESEARCH QUESTIONS

Three research questions were set from the beginning:

- x What drivers are critical to the financing of sustainable construction projects?
- x What critical barriers affect the implementation of sustainable construction project financing in Ghana?
- x What important strategies can be adopted for the promotion of sustainable construction projects financing in Ghana?

5.3 REVIEW OF OBJECTIVES

A review of the findings of the various objectives are discussed in the subsections below.

5.3.1 Objective 1: To identify critical drivers of sustainable construction project financing

Among the eight drivers identified from literature, the two groups in finance and construction industry acknowledged that based on the explanation given for the following drivers Ethical Investment, Emerging Business Opportunity, Reduced Life Cycle Cost, Conservation of Resources, and High Return on Investment were considered to be the most critical drivers that was going to motivate stakeholders to change their attitude towards achieving the aim of sustainable construction by financing such projects. With Corporate Image as an important driver, the finance group acknowledged it was one of the critical drivers, but the construction industry group thought it was not that critical to the financing of a sustainable construction project.

5.3.2 Objective 2: To identify critical barriers of sustainable construction project financing

The participants from the two groups agreed on seven (7) out of the eight barriers as the most critical to the financing of a sustainable construction project. These barriers are viewed as factors that can discourage investors and other stakeholders in the construction community from having sustainable construction projects on their portfolio's. The critical barriers are Lack of credible Information database, Cost Related Barrier, Barrier of Split Incentives, Lack of policy direction and regulatory gaps, lack knowledge among professionals, insufficient government support and inadequate financing schemes.

5.3.3 Objective 3: To identify strategies for the promotion of sustainable construction project financing

Strategies that promote the financing of sustainable construction project were identified and out of which the participants selected the strategies considered important. Out of the eight

strategies identified, six of them were acknowledged by both groups as being important to the financing of sustainable construction with the finance group having a seventh strategy they saw as also been important. The strategies are as follows:

™ Both Groups: Government Support

™ Both Groups: Training and Education

™ Both Groups: Incentives

™ Construction Group: Legal framework for Sustainable Construction

™ Finance Groups: Positioning the finance sector to handle sustainability issues

5.4 CONTRIBUTION TO THEORY AND PRACTICE

5.4.1 Contribution Theory

The research makes the following contribution to knowledge:

1. Several studies have been conducted on implementing sustainable construction practices and building capacity of professionals in the construction industry. However, none of these studies has looked at the financing of sustainable construction projects in the Ghanaian construction industry. In order to bridge this knowledge gap, this study identified strategies that promote the financing of a sustainable construction project in Ghana.
2. The findings of this study also identified drivers which include ethical investment, emerging business opportunity, reduced lifecycle cost, conservation of resources, and high return on investment.
3. The study also identified the following barriers of sustainable construction project implementation; cost related barrier, lack of knowledge among professionals, insufficient government support and inadequate financing schemes.

5.4.2 Contribution to Practice

Several research studies on sustainable construction in Ghana has been conducted, one considering finance is lacking. The contribution this study has made to practice is that, stakeholders can use the strategies proposed to develop policies in order to attract and increase the financing of sustainable construction in the country.

5.5 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are suggested to government and practitioners in the construction and finance sectors. Summarised below are the suggestions that will aid the financing of more sustainable construction projects.

5.5.1 Setting up of Green Building Council

Even though there is an existence of a green building council in Ghana known as the Ghana Green Building Council, it is a membership-based organisation that is committed to helping create sustainable communities in Ghana. A proper council needs to be set up by the government with the legal backing to undertake the following:

- x Develop modules to educate the general public and also train professionals on issues of sustainable construction such as financing especially at the local level to enable them to handle the issues of permits for construction.
- x Develop a building code that is geared towards sustainable projects in Ghana, which can serve as a tool to rate projects on their level of sustainability.
- x Develop an information database to give investors the chance to quickly make decisions regarding investments in sustainable construction in the country.

5.5.2 Setting up of a Bank solely concerned with the financing of Sustainable Construction Projects

The government must set up an institution that is solely aimed at financing sustainable construction projects in the country. The entity may be responsible for the following:

- x Sourcing for funds internationally that are geared towards ethical investment and investing such capital in projects in the country.
- x Providing soft loans that will allow investors to access such capital to be able to finance sustainable construction projects due to their high upfront cost.

5.5.3 Enabling Environment

The government must ensure that an enabling environment has been created economically to allow investors and developers have the confidence of investing in sustainable construction in the country. Policies must also be formulated to guide the construction and finance industry of sustainable construction issues to make it easy for them to work.

5.6 DIRECTION FOR FUTURE RESEARCH

The study identified drivers, barriers and promotion strategies of sustainable construction project financing. This study suggests areas where further research can be conducted to support this research.

- f* Further studies can be conducted on the strength and weakness of financing schemes of sustainable construction project financing.
- f* Further studies can be conducted on developing sustainable construction project financing policy guidelines for the financial sector.

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APPENDIX 1 ±Questionnaire

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

COLLEGE OF ART AND BUILT ENVIRONMENT

FACULTY OF BUILT ENVIRONMENT

**DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND
MANAGEMENT**

This questionnaire forms part of an MPhil research being undertaken at the Kwame Nkrumah University of Science and technology.

***Topic: STRATEGIES TO PROMOTE SUSTAINABLE CONSTRUCTION PROJECT
FINANCING***

The purpose of the questionnaire is to enable the achievement of the following research objectives:

1. To identify critical drivers of sustainable construction project financing;
2. To identify the critical barriers to the promotion of sustainable construction project financing in Ghana;
3. To identify important strategies for promoting sustainable construction project financing in Ghana.

Your assistance in answering the questions set out below would be much appreciated. Please do not leave any identification marks on the forms in order that the replies remain anonymous. The information provided will be used solely for academic purposes and will be treated confidentially.

Thank you.

For any enquiries, please contact me;

Oppon James Anthony

Tel. No: +233(0)541230588, +233(0)200751702

Email: *anthonyjamesoppon@gmail.com*

SECTION A

Please provide the correct information by ticking [] the appropriate box and fill in the blank spaces where necessary.

Respondent Profile

1. Indicate Organisation

- Finance
- Construction Industry

2. Indicate your highest level academic qualification

- Doctorate Degree
- Master's Degree
- Bachelor's Degree
- Higher National Diploma
- Other

3. Working Experience In your Industry

- 21-25 years
- 16-20 years
- 11-15 years
- 5-10 years
- less than 5 years

4. Years involved with projects that are sustainable construction or meant to conserve the environment?

- 1-5 years
- 5-10 years
- 10-15 years
- 15 years and above

SECTION B

Ranking of Various Drivers using the Likert Scale

Using a Likert scale of 1-5, rank the following drivers on how critical they are to sustainable construction project financing.

| | | | | |
|---------------------|----------------------|-----------------------|-----------------|----------------------|
| 1 | 2 | 3 | 4 | 5 |
| Not Critical | Less Critical | Quite Critical | Critical | Very Critical |

| Code | Drivers | Likert Scale | | | | |
|-------------|-------------------------------------|---------------------|----------|----------|----------|----------|
| | | 1 | 2 | 3 | 4 | 5 |
| DV 1 | Corporate social responsibility | | | | | |
| DV 2 | Ethical investment | | | | | |
| DV 3 | Corporate Image | | | | | |
| DV 4 | Emerging business opportunity | | | | | |
| DV 5 | Reduced life cycle cost of Projects | | | | | |
| DV 6 | Conservation of Resources | | | | | |
| DV 7 | High return on investment | | | | | |
| DV 8 | Mandatory Legislation and Standards | | | | | |
| | | | | | | |

SECTION C

Ranking of Various Barriers using the Likert Scale

Using a Likert scale of 1-5, rank the following barriers on how critical they are to sustainable construction project financing.

| | | | | |
|---------------------|----------------------|-----------------------|-----------------|----------------------|
| 1 | 2 | 3 | 4 | 5 |
| Not Critical | Less Critical | Quite Critical | Critical | Very Critical |

| Code | Barriers | Likert Scale | | | | |
|-------------|--|--------------|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| BR 1 | Lack of information and inconsistent data | | | | | |
| BR 2 | Cost related barrier eg. High upfront cost, shorter payback period | | | | | |
| BR 3 | Risk Related Barriers | | | | | |
| BR 4 | Barrier of split incentives | | | | | |
| BR 5 | Lack of policy direction and regulatory gaps | | | | | |
| BR 6 | Lack of knowledge among Professionals | | | | | |
| BR 7 | Insufficient government support | | | | | |
| BR 8 | Inadequate financing schemes | | | | | |
| | | | | | | |

SECTION D

Ranking of Various Promotion Strategies using the Likert Scale

- a) Using a Likert scale of 1-5, rank the following promotion strategies on how important they are, to sustainable construction project financing.

| | | | | |
|----------------------|-----------------------|------------------------|------------------|-----------------------|
| 1 | 2 | 3 | 4 | 5 |
| Not Important | Less Important | Quite Important | Important | Very Important |

| Code | Strategies | Likert Scale | | | | |
|-------------|---|--------------|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| ST 1 | Credible Information Database | | | | | |
| ST 2 | Government Support | | | | | |
| ST 3 | Positioning Finance Sector to Handle Sustainable Projects | | | | | |
| ST 4 | Training and Education | | | | | |
| ST 5 | Legal framework for Sustainable Construction | | | | | |
| ST 6 | Provision of incentives | | | | | |
| ST 7 | Research on sustainable construction and it's financing | | | | | |
| ST 8 | Market for Sustainable Construction Products | | | | | |
| | | | | | | |

APPENDIX 2- Acronyms

Acronyms and Their Meanings

GBCSA – Green Building Council of South Africa

GGBC - Ghana Green Building Council

IDFC – International Development Finance Club

IFC - International Finance Corporation

OECD – Organisation for Economic Co-operation and Development

RoGBC - Romanian Green Building Council

SPSS - Statistical Package for the Social Sciences

UNEP – United Nations Environment Programme

UNEPFI - United Nations Environment Programme Finance Initiative

USGBC – United States Green Building Council

WGBC - World Green Building Council

WWF - World Wildlife Fund